



FRIDAY, SEPTEMBER 4, 1896.

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Contributions.

Handling Logs in a Shallow River.

MACON, Ga., Aug. 28, 1896.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I want to know the cheapest way to get logs up a shallow river, distance 25 miles, depth of water 2 to 6 ft., current about four miles per hour; can load logs on flat boat. It may be that some of your readers or advertisers have appliances that will be of value to me.

WIRT W. HALLAM.

Solved at Last.

WILLIAMSPORT, Pa., Aug. 31, 1896.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read with considerable interest the data given by your paper on compressed-air motors for street cars. I think that if you will allow me space I can show the investors of street-car bonds and stock there is a cheaper power for street cars than has been shown in practice up to the present time.

On Jan. 7, 1896, a patent was granted to a Williamsport inventor for an improved spring motor for propelling street cars. This motor is built on entirely different lines than any yet tried. It is a known fact that you cannot get a steady power from springs unless you have a regulator. A street car doesn't need steady power and the inventor claims that he can propel a car 24 miles an hour and can run 24 miles at the same rate of speed before the springs need winding again. The springs can be wound on the car by hand while the car is in motion, but it has been found quicker to wind by a small portable engine placed at any convenient point along the route, or a large engine of, say, 250 H. P., can wind 20 cars at one time. The car can start quickly and can be stopped as quick as a car equipped with an air-brake, and will pull any car of 15 tons up a grade of six per cent. at the rate of six miles per hour.

They can be fitted on any street car truck and will not weigh as much as a compressed-air motor and tanks, and can be built for less than \$1,000 each. It seems to me that the remarkable cheapness of this motor power, if proved to be a success, would be looked into by railroad companies and investors who are looking for a 15 per cent. dividend on their stock.

R. H. CROSBY.

[Yes, yes, you can be sure this "motor power" will be looked into when it is proved to be a success. We remember but one proposition more remarkable. That was the plan of a doctor of divinity for working the elevated railroads of New York, which was explained in the New York Herald a few years ago. He proposed that the elevated structures should be converted into aqueducts and supplied with water from the Hudson or the Harlem. Then the cars or the substitutes for them could slide down the length of the island with great comfort to the passengers and no danger of collision or derailment.—EDITOR RAILROAD GAZETTE.]

The Limits of the Compressed Air Motor.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In regard to the communications of S. A. R. and Mr. Walker in reply to "Investor," it appears that more might be said to put the statements they make in a proper light. S. A. R. says "a trolley road uses up enough in extra central station and permanent way cost to more than overbalance the compressed air system." Now, let us look at the facts. Both systems must get their power from coal. This requires boilers and en-

gines for both. One uses dynamos, the other air compressors and attendant apparatus. In this there is no saving with the compressed air system, as the compressors and their adjuncts will cost as much as the dynamos. In the matter of efficiency between the coal pile and the axles of the car, the trolley is and always will be superior to any compressed air system and therefore the total horse-power at the central station will be less with the trolley.

The roadbed itself will be the same for both, as street railroad tracks are now laid heavy enough for the heavier compressed air equipment, and there will therefore be no saving in roadbed to help the compressed air system. One thing remains under this head to be considered—it is the cost of the overhead trolley. Call this \$5,000 a mile, which will pay for the best class of work. If, now, the road has a good traffic, of the sort this discussion is about, there will be an equipment of at least one car for each block of street along the line. With 12 blocks per mile this would give 12 compressed air car equipments per mile. The amount available to pay for the extra cost of the compressed air equipment per car will then be one-twelfth of \$5,000, or \$417 a car. Now, according to a rough speculation, this is not enough. It will be nearer \$1,000 a car. It appears from this that there is no saving to be expected in first cost with compressed air equipment, and S. A. R. should leave general statements and get into cold figures if his point is to be maintained.

Mr. Walker falls into the very class of talk about compressed air motors that "Investor" has deplored. Of what value is it to tell us that a twist of the wrist puts 60 lbs. extra pressure on the piston? What does this tell us about the rate of acceleration with one or two trailers? What do we know more than before now that we are told that the car in question showed its ability "to get as good a hump on it as the cable or electric car" in Rome and in New York? What engineers want to know is what was the acceleration? What was the load? Were there one or two trailers? How many stops and starts were made per mile during the trials? Will the air-tanks shown in the illustrations in the Railroad Gazette of May 29 supply air enough to accelerate a compressed air car and two trailers once each block along the line of the road with a rapidity equal to the electric motor when the air supply stations are a practicable distance apart? Mr. Walker must not forget that it is the acceleration which uses up the air. For steady running but little air is required.

In the matter of pounding the rails the electric motor produces little or no evil effect beyond that which arises from the fact that it is a heavy body and not so heavy as the compressed air machine. It is an error to say that electric motors are not flexibly supported. A little more than one-half of the weight is held on springs directly and what remains weighs no more than the parts of the compressed air motor that will rest directly on the axle. So far as the "nerves of the passengers" are concerned, the springs that are provided for the body of the car are independent of those which support the motors and therefore there is no apparent point to Mr. Walker's remark.

It is extremely doubtful if Mr. Walker is right in saying that one "could not contract to build an electric road downtown in New York City for any price." What would be the real objection to an electric conduit line equal in quality to the one uptown?

If the Hardie motor has shown its ability in Rome and in New York to "get as good a hump on it as the cable or electric car" those who made the observations necessary to reach such a conclusion must know something about the amount of air used, and any competent engineer can make a very close calculation of the air required when the length of time is given during which the excess of 60 lbs. is used. About the efficiency of compressors and central station apparatus for compressed air there is much reliable data, so there appears to be no reason why those who make emphatic general statements about the system should not be more specific. What has been asked for are figures and facts developed by an intelligent analysis of the real value of the much talked of recent improvements in the use of compressed air.

INVESTOR.

Club-Houses for Railroad Men.

The great problem in railroad work at the present time is economy. Excessive competition has destroyed all monopolies, monopolies of labor as well as in other lines. The railroad manager cannot ride rough-shod over the public or his men; neither can organized labor any longer dominate the policy of the manager. The last three years have levelled not only values, but powers. Great economies have been effected on railroads, but not enough to match the losses of revenue. Materials cost less; the cost of labor has not been much reduced, though it has increased in value, more service being performed without increase in compensation. The field for economy has not yet been fully cultivated. We have saved coal by premiums to engineers, have reduced the cost of lubrication 50 per cent.; have saved much by improved methods of transferring freight; by the tonnage rating of train loads; by the piece-work system in repair shops, and various other ways; but one of the greatest opportunities is that of raising the standard of the employees. Brown's disci-

*From a paper by Mr. Ralph Peters, Superintendent, Pittsburg, Cincinnati, Chicago & St. Louis, Cincinnati, O.; read at the July meeting of the Central Association of Railroad Officers.

pline has been the means of a great advance, but, looking at the problem broadly, we have hardly started in the work of developing the men into faithful, loyal and efficient arms of the railroad service.

"The railroad superintendents and their associate officers have been wonderfully improved. The work of the railroad is their own work. They have a lively personal interest in everything pertaining to it. It is part of their life. This same spirit instilled into the heart and mind of every employee upon the road will accomplish greater results in the line of economy than anything else. We all know how this improvement in the superintendents and associate officers has been brought about—by means of the education resulting from social intercourse. We can accomplish the same thing with the subordinate employees, if we pursue the right course. The employee who takes the same interest in his work that a superior officer takes is worth a dozen of the men who are mere time servers. The men who are close to the work are those who can accomplish the greatest economies. The higher the standard of the men who are close to the work the more sure we are of these economical results. There have been many attempts made to bring this about. The introduction of the profit-sharing system has been a move in that direction, and has accomplished some good, also the modified forms of applying discipline, the voluntary relief departments and savings funds. The establishment of club-houses for employees will be another, and in my opinion a more efficient, move to bring about this end.

"We all know that the brakeman who is always neat and clean is the honest, faithful one of the crew. He loves his home, he saves his money, he has good associates and he is always ready to do good, efficient work, protecting the interests of the company in every way possible. We also know that the slovenly brakeman is nine times out of ten the lazy one, who works merely to meet the pay car and gets through with what he has to do with the least exertion possible. . . . The railroad companies should encourage employees to organize clubs, and through these clubs furnish what the individual cannot procure. There should be at the end of every division run a club-house, suitably and conveniently arranged, to give the men an opportunity to clean up after the run or the day's work, and to amuse themselves by reading or by enjoying games of pool or billiards, or to otherwise occupy themselves during their idle time."

Mr. Peters here cited the good results of the Young Men's Christian Associations at four places on the Chesapeake & Ohio and the similar establishments in New York and Philadelphia; but he holds that railroad men's club houses should be operated and controlled by the employees themselves, with reasonable assistance from the company.

About two years ago some of the men on his road, at Pendleton, started an athletic club in a room over a saloon, the intention being to have sparring matches, etc., but some of the more sensible men consulted the superintendent in the matter and the result was that the club established was so respectable and so well-liked that the saloon-keeper became bankrupt and is now trying to oust the club from his building. Other saloons in the vicinity have been closed up. This club has bath-rooms, a reading-room and a billiard-room; the janitor is furnished by the railroad company. The membership is now 200, the dues being 50 cents a month. Regular meetings are held every Thursday night, with readings or lectures, officers of the road giving addresses during the fall and winter months. Mr. Peters speaks enthusiastically of the results of this club in improving the men. This example was followed at Newark, O., by employees of the Baltimore & Ohio, and lately a similar club has been organized at Columbus.

If the men manage their clubs themselves they have something to work for and something to think about, the club taking the place of labor organizations, which originate in the desire of the men to get acquainted with one another, and to show their ability in an association. A club-house should have a large hall to be used jointly as a gymnasium and lecture-room; it should have a billiard-room and reading-room and a smoking-room. It should have not less than two bath-rooms, with all modern conveniences. Where there are sufficient men to support it, there should be a restaurant and barber shop attached. This only could be done, however, at large terminals.

Mr. Peters then described the extensive club of the Grand Trunk, at Point St. Charles, Canada, which was organized in 1857. There is here a mess-room, where the shop men take their luncheon, and schools for the children of employees. The objection to this club is that it is too much a company affair, being officered by the officers of the road.

Track Elevation at South Norwalk.

The work just completed through South Norwalk, Conn., on the New York Division of the New York, New Haven & Hartford road is part of the general plan for elimination of grade crossings and at the same time to provide for increasing traffic by the addition of two tracks, making a four-track roadway. This particular portion consisted of raising the grade about 15 ft. through the city of South Norwalk and across the Norwalk River, a distance of about three-fifths of a mile. This improvement connects with former work at the east end by a descending grade of 30 ft. per mile, and on a level at the west end. It also entailed new connections with the Danbury Division and the Wilson's Point Branch, single-track lines, requiring a distance

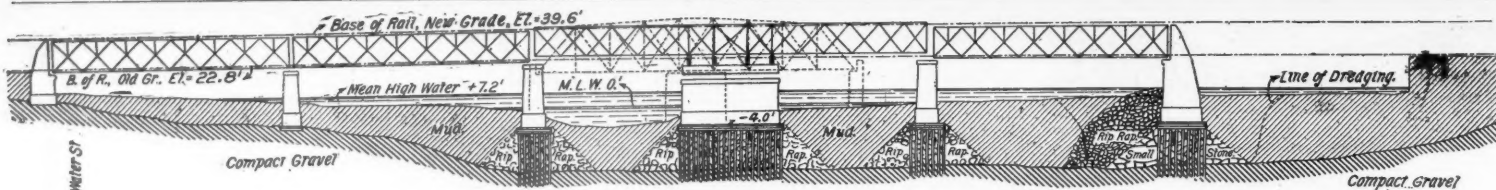


Fig. 2.—Four-Track Bridge, with 200-Ft. Drawspan, at South Norwalk, Conn.—New York, New Haven & Hartford Railroad.

The Dotted Lines Show the Old Structure.

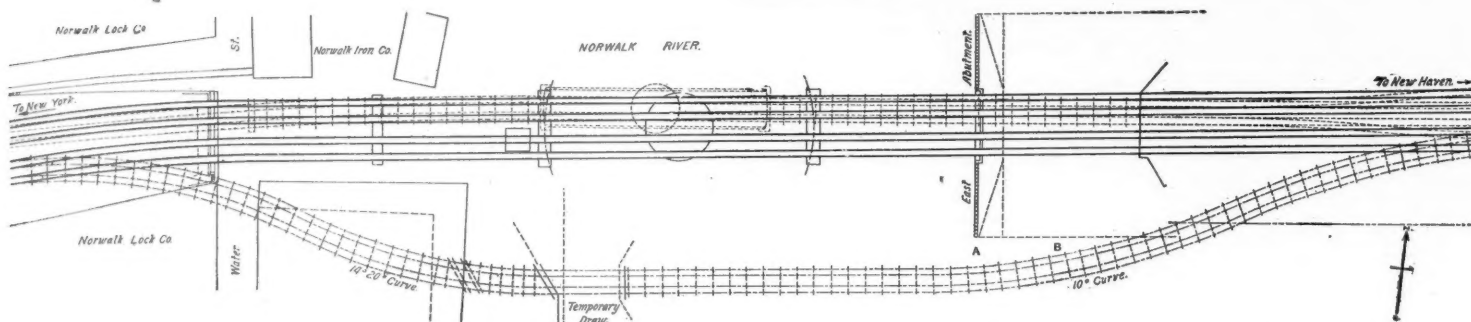


Fig. 1.—Plan of New, Old and Temporary Tracks—Norwalk Bridge.

The Dotted Lines Show the Old Structure.

of half a mile on each to reach the old grade, with a maximum of 40 ft. per mile.

On the main line two crossings were eliminated, and three on the branches. The old and the new alignment are very nearly the same. To carry the traffic during construction a double-track trestle was built on the new grade, and as nearly as possible on the line of the two new (southerly) tracks, making necessary the shifting of the old tracks at several points to allow the new work to go in proper position. At the river the line of this trestle was placed far enough to the south to permit the construction of a new draw-bridge, which, to avoid interruption of navigation, it was necessary to construct in the open position.

In the temporary line a second-hand wooden "jack-knife" draw, with a 50-ft. clear opening, was used, supported by a trestle made up of four Howe trusses, hinged at one end, swinging horizontally, and supported at the outer end by three cables passing upward and over a frame, and securely anchored. This structure required an unusual amount of bracing, owing to its height (base of rail being 40 ft. above low water) and the almost fluid consistency of the mud in the river. This mud is from 14 to 32 ft. deep and so soft that piles sink into it from 6 ft. to 10 ft. by their own weight; so that the trestle really carried its loads about 70 ft. above the actual foundation. On account of this mud, four extra piles were driven for each bent, to take the place of braces for the trestle below the water line, thus making 12 piles per bent instead of eight, as was originally intended. Piles could not be driven into the gravel below the mud, as a blow sufficient to do this would break the pile.

The temporary trestle, a cross-section and part side elevation of which is shown in Fig. 5, carried the very heavy traffic of the New York Division for a year with complete satisfaction, though the train resistance, owing

to the sharp curves just west of the draw, was excessive. The heaviest eight-wheel engines are used on passenger trains and very heavy eight-coupled engines in freight service, and the speed of all trains was rigidly limited to three miles an hour.

When the embankment for the new permanent grade east of the bridge was made, the mud below began to move, and it was found desirable to re-enforce the trestle by a compact line of piling, placed alongside and held in position by means of 1½-in. rods passing underneath the trestle to an anchorage on the other side, composed of a group of five piles. A plan and section of this construction is shown in Fig. 4. This re-enforcement served a double purpose, in holding the trestle in place from the pressure of mud on the south side while dredging for the east abutment was in progress, and again when the embankment was made, in protecting the trestle from the pressure of the fill on the north. The maximum sidewise movement of the trestle was 4½ in. at this point. On the north side of the fill, however, the mud bulged up some 6 ft. for a width of about 30 ft. and about 20 ft. from the foot of the slope.

The only street crossing presenting unusual features was that at the intersection of Washington and Main streets, each occupied by a single-track trolley line, passing around the corners, but not crossing the railroad tracks (see Fig. 3). The single track of the Danbury Division, which joins the New York Division just east of this point, was maintained, together with the two old main tracks, by being shifted as far north as the right of way would admit, while two tracks on the new grade were constructed to the south, as close as possible to the street railway. The track of the latter prevented placing the new tracks on the permanent line. Main-line trains were shifted to the elevated trestle at intersections of grades, giving room for raising the Danbury Division track, after which all three tracks on

the new grade were shifted to the north, to give room for the construction of the south half of the ironwork. When finished, this portion of the permanent bridge was used by trains until the the entire bridge was completed

This is a through structure, with three Pratt trusses, varying from 110 to 150 ft. span, and carrying four tracks on a 2 deg. curve. The grade of the street was lowered 2 ft. and the railroad tracks raised without interfering with regular street traffic or either of the street railroads.

The permanent work across Norwalk River consists of a deck bridge of three fixed spans of 120 ft. each and one draw-span 200 ft. long, carrying four tracks. The west abutment and a small pier on the west side of the river are built on a compact gravel foundation bed, the latter by means of a cofferdam 20 ft. deep. The center and rest-piers, together with the east abutment, were built with the aid of open caissons, shown in Fig. 6. The mud in the river, as stated above, was very soft for a depth of 32 ft. below low water without much lateral resistance. Below this was a very compact gravel. At the site of the draw-piers, after dredging to a short distance below the cut-off point, piles were driven and sawn off 13 ft. below low water. For the center pier (50 ft. in diameter) 1,466 piles were driven. The caissons were then sunk and masonry built.

At the east abutment the mud was all dredged out down to the gravel, and replaced by broken stone, after which piles were driven into the mass of stone and sawn off as in the other piers. The piles were sharpened to a section 4 x 4 in. and then shod with two iron straps, $\frac{3}{8}$ x 3 x 28 in., put on at right angles to each other. This protection for a pile costs only 15 cents. On account of the length of this abutment the caisson was made in two parts, each 25 x 85 ft., and the masonry was connected by cutting out the adjoining ends after the sections of the caisson were sunk in position. Riprap was placed in front up to the high-water line to assist in

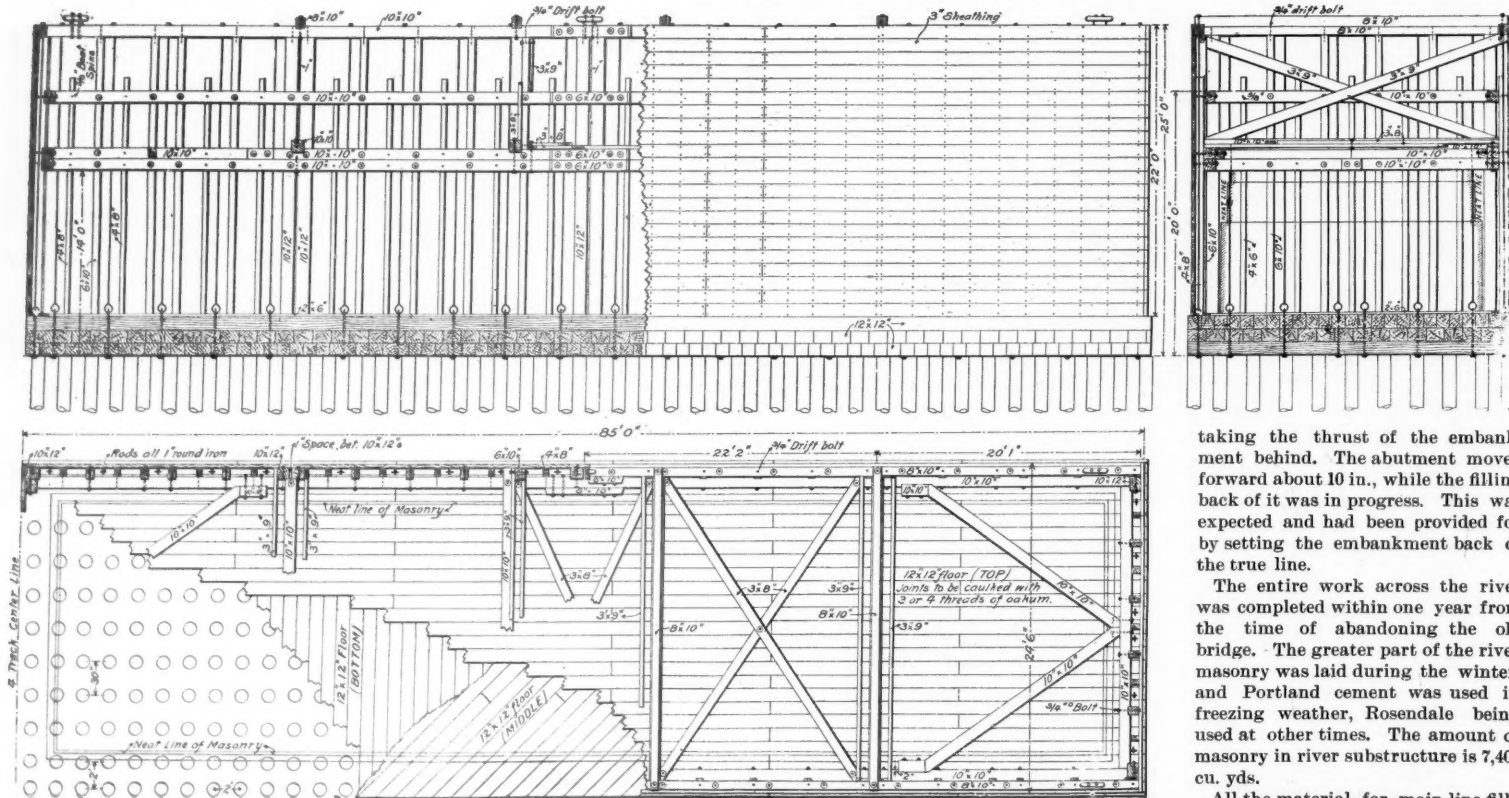


Fig. 6.—Caisson for the East Abutment—Norwalk Bridge.

taking the thrust of the embankment behind. The abutment moved forward about 10 in., while the filling back of it was in progress. This was expected and had been provided for by setting the embankment back of the true line.

The entire work across the river was completed within one year from the time of abandoning the old bridge. The greater part of the river masonry was laid during the winter, and Portland cement was used in freezing weather, Rosendale being used at other times. The amount of masonry in river substructure is 7,400 cu. yds.

All the material for main-line filling, about 200,000 cu. yds., was brought from a point 23 miles away in trains of

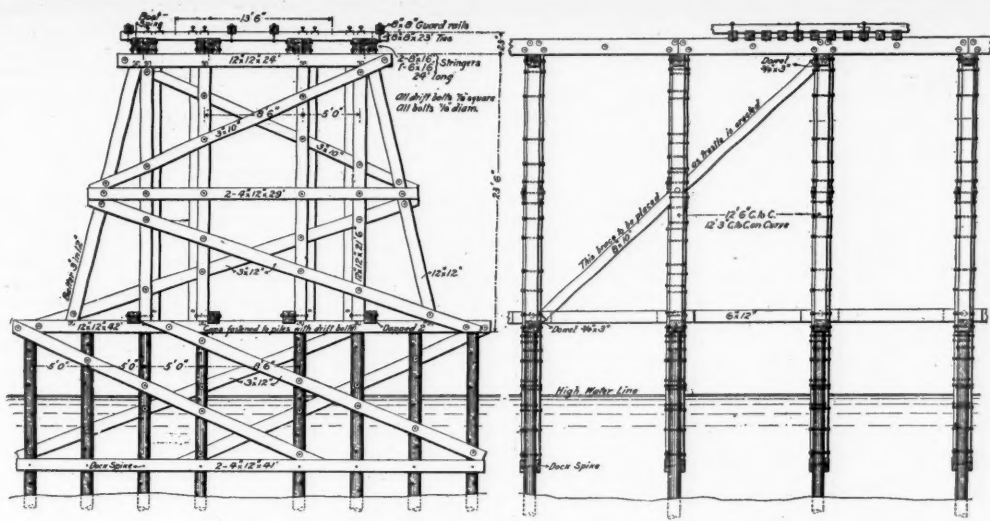


Fig. 5.—Cross-Section and Part Side Elevation of Temporary Trestle.

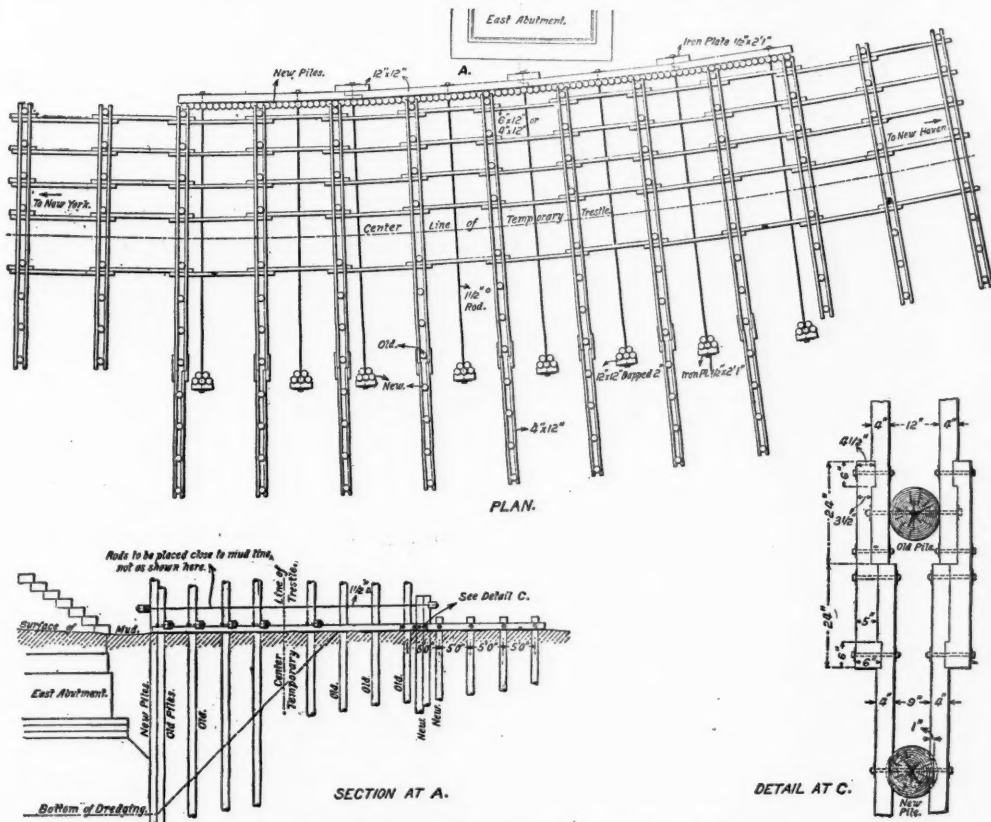


Fig. 4.—Re-Enforcement of Temporary Trestle—Norwalk Bridge.

25 cars, each car carrying about 25 cu. yds. This was necessary, as there was no available borrow near the work, but the cost of transportation was more than offset by the small outlay with which the material was obtained, it being a sandy loam easily excavated by steam shovel. At the same time it is to be noted that only with cars of large capacity and engines capable of hauling trains of considerable length, at good speed, could so large a quantity be transported in so short a time, on a very busy road. And the fact that the regular traffic on the road is very large was the main reason why it was important that the whole work of the improvement, necessitating delays to every train while it continued, should be completed in the shortest possible time; so that the use of an efficient plant for delivering gravel was an essential factor in the economical accomplishment of the work.

Mr. R. M. Berrian, the engineer in charge, devoted his whole time to this work, the difficulties connected with the construction of foundations on such a very soft mud bottom necessitating the most constant inspection for weeks at a time. The difficulties at the Main street crossing were complex, making much work and annoyance for the operating department as well as for the engineers. Besides the electric street railroad, which had to be kept running, the nearness of the station on the west restricted train movements, and nearly all operations were hampered by the narrowness of the right of way. At the point marked "S & C," Fig. 3, east of the new signal tower, large brick buildings stand within about 8 ft. of the track.

American Association for the Advancement of Science Buffalo Meeting.

The meeting of the American Association for the Advancement of Science at Buffalo Aug. 24-28, was small in numbers, but prolific of papers. The most crowded section was that of Chemistry, where some seventy papers were read. The most popular section seems to have been

that of Social Science and economics, judging from the crowded section room and the fact that the daily press of Buffalo published in full two of the papers read before this section, but not one from any other section while the meeting was in progress, nor even any of the presidential and vice-presidential addresses.

The section of Mechanical Science and Engineering had more papers than usual besides the address of F. O. Marvin, Vice-President, on "The Artistic Element in Engineering."

The matter of arranging the meeting for next year became the occasion of a severe contest between the council and the members, in which the latter finally triumphed. A small committee of the council recommended the practical abandonment of next year's meeting by holding a merely formal one at Toronto on Aug. 17, 1897, to welcome the British Association which will meet there on Aug. 18. This scheme would exclude all papers and even the presidential addresses, leaving nothing of any account to go into the *Transactions* for 1897; and it was offered by editors of the *Journal Science*, in connection with a proposition to raise membership dues to \$5 a year, and to discontinue publication by the association of anything more than a small pamphlet, while making *Science*, which is not controlled by the association, its official organ. As \$750 was given to *Science* last year out of a depleted treasury, these measures did not even pass the council; but the proposition to abandon next year's meeting did pass, notwithstanding strenuous opposition, but it met with a storm of protest and objection in the general session. It was resolved to hold a regular meeting next year at such time and place as the Council should determine. The Council afterward fixed on Detroit, Aug. 9, with a recess to Toronto before finally adjourning, so as to meet and welcome the British Association on its arrival there.

Wolcott Gibbs, who withdrew from the association about thirty years ago, was elected President, and John Galbraith Vice-President for the section of Mechanical Science and Engineering.

Resolutions were passed favoring further legislation

to establish the metric system in the United States, and opposing pending legislation against vivisection.

Quite a party of the scientists went out one day to inspect the auto-pneumatic signal apparatus of Dr. I. H. McCartney, which has been for several years in successful operation on the Lake Shore Railroad.

Abstracts of some of the papers follow:

Apparatus for Exhibiting the Distribution of Moisture in a Steam Main. By D. S. Jacobus.

A glass tube, about 3 in. in diameter and 4 ft. long, was mounted horizontally between two special stuffing boxes so arranged that no metal pieces came in contact with the glass. The steam passed through this glass pipe into an iron nipple of 3-in. pipe about 12 in. long. In the sides of this nipple were two slots about 1 in. wide and 10 in. long, each covered with plate glass in such a way as to make a steam-tight joint. After passing the iron nipple, the steam entered a second piece of 3-in. glass tubing, about 15 in. long, and finally passed into a condenser. Various calorimeter nozzles of 1/2-in. pipe were inserted in the iron nipple, and their action studied when they supplied steam to a Barrus calorimeter.

Before entering the glass tube, the steam passed upward through a vertical pipe.

The apparatus showed to the eye what had been dem-

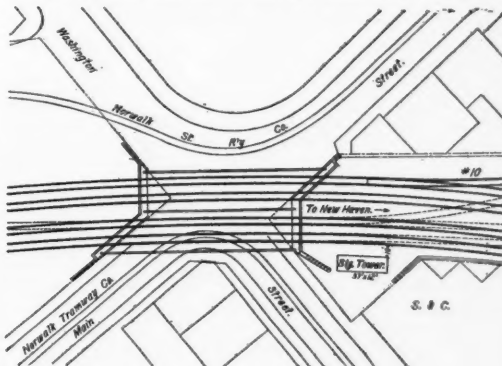


Fig. 3.—Main Street Crossing.

onstrated in previous experiments made by Prof. Denton and the writer, namely, that for ordinary velocities of team, the entrained water would finally collect at the bottom of the pipe and run along in a small stream, and that practically all this water could be drawn from the pipe by means of a 1/2-in. nipple, the end of which was made flush with the bottom of the pipe.

The apparatus was provided with a thick plate-glass shield to prevent injury to the observer should the glass tube explode.

Values of the Heat of Combustion of Various Gases.

By D. S. Jacobus.

The full title of this paper was "Values of the Heat of Combustion of Various Gases per Cubic Foot, for Use in Calculating the Heating Power from the Analysis of Gas."

The figures which have been deduced are as follows:

Gas.	Sym- bol.	Weight of 1 cu. ft. in lbs. at atm. pres- sure and 32° Fahr.	B. T. U. for 1 cu. ft. of gas burned at atm. pressure and 32° Fahr.	Vapor in products of combus- tion con- densed.	Vapor in products of combus- tion not condensed.
Hydrogen.....	H	.005591	346.8	292.8	
Carbonic oxide.....	CO	.007813	341.3	341.3	
Methane or marsh gas..	CH ₄	.004464*	1064	956	
Ethylene or olefiant gas.	C ₂ H ₄	.07898	1892	1583	
Acetylene.....	C ₂ H ₂	.07346	1576	1522	
Benzole vapor.....	C ₆ H ₆	.22120	4079	3916	
Propylene.....	C ₃ H ₆	.11714*	2473	2312	

The above heats of combustion, with the exception of that of hydrogen, are deduced from the work of Julius Thomson.† The densities used in calculating the weight per cubic foot were traced to the original authority. The writer has used Thomson's work† in preference to that of Berthelot in the calculation, because in Thomson's experiments the gases were burned at the constant pressure of the atmosphere, whereas Berthelot exploded the gases at a constant volume, and then applied a correction to reduce his results to an equivalent at a constant pressure. Furthermore, Thomson made many more experiments on each gas than Berthelot, and the variations in his experiments for a given gas were much less than with Berthelot.

Apparatus for Tracing a Curve Representing the Force Required to Overcome the Inertia of the Reciprocating Parts of a Steam Engine. By D. S. Jacobus.

The apparatus was designed to illustrate to students the general form of the curve, showing the force required to accelerate the piston of a steam engine.

A weight was made to have the motion of the piston, and the force required to move the weight was recorded

*Density calculated from the atomic weights for CH₄ and C₃H₆.

†*Annales de Chimie et de Physique*, 1831, Vol. xxiii., p. 155.
†See article by the writer in the *Stevens Indicator*, October, 1892, where all the heats of combustion except for acetylene are given per pound of the gas.

graphically. The weight was held between two sets of springs. The springs were so stiff that the force required to accelerate the weight deflected them a very small amount. The pencil tracing the curve rose in proportion to the deflection of the springs. The movement of the springs was magnified a number of times, so that in the apparatus as constructed the pencil moved $2\frac{1}{2}$ in., whereas the weight moved about $\frac{1}{8}$ in.

The apparatus was mounted on the top of the piston of a vertical engine. Steam was admitted to the lower side only of the piston in running the engine. The card traced was the full length of the stroke of the engine, or 7 in., and $2\frac{1}{2}$ in. in width at the widest parts, as already stated.

The apparatus was so arranged that it could be readily calibrated and this was done in the presence of each set of students witnessing the experiments.

An Apparatus for Accurately Measuring Pressures of 2,000 lbs. per square inch and over. By D. S. Jacobus.

A steel plug $\frac{1}{2}$ in. in diameter was fastened into a fly-wheel about 18 in. in diameter. The plug fitted into a bushing .5005 in. diameter. A pressure of oil was made to act on the underside of the plug, which was mounted in a vertical position. In measuring a pressure, the fly-wheel was spun around so as to eliminate friction between the plug and the bushing. The weight of the plug and fly-wheel balanced a portion of the oil pressure, and the remainder was determined by measuring the force required to hold down the plug and fly-wheel.

In order to measure this force, and still be able to rotate the plug freely, a ball-bearing device was placed at the top of the plug. A platform scale was used to measure the forces.

Friction Brakes for Steam Turbines. By J. E. Denton.

In experimental investigations of the performance of steam turbines the determination of the power wasted in the speed reduction gearing, or of the total power generated by the action of the steam upon the turbine wheel, requires that this power shall be absorbed by a dynamometric brake applied directly to the turbine shaft without the intervention of the reduction gearing through which the power of the modern turbine is usually applied.

The writer has found that a simple and admirably perfect brake for such use is a disc fixed upon the turbine shaft, and enclosed in a stationary cylinder nearly full of water. The stationary cylinder is suspended by a wire, which receives a torsional strain equal to the resistance between the revolving disc and the water, and also that due to any attachment mounted on the cylinder, such as a speed counter. The wire serves as a spring by which the work absorbed by the brake can be measured. The load can be moderately varied by regulating the rate of flow of water through the cylinder, the water being fed at the center and leaving at the edge.

With a disc $4\frac{1}{2}$ -in. in diameter, revolving at 20,000 revolutions per minute, 16 H. P. was absorbed with perfect steadiness for an indefinite period.

One or more discs can be used, each revolving disc being between two discs fixed in the stationary cylinder, with about $\frac{1}{8}$ -in. clearance between them.

The law of resistance of brass discs was found to be as follows:

$$M_r = 0.05 DN^2(R_1^4 - R_2^4).$$

In which

M = moment of resistance in foot pounds produced by brake.

D = number of revolving discs.

N = revolutions per second.

R_1 = radius of disc in ft.

R_2 = radius of hub of disc in ft.

A New Inspection Car.

In the *Railroad Gazette*, March 8, 1895, was described a light inspection car built by the Railway Cycle Manufacturing Co., of Hagerstown, Ind., to carry one person. This company has recently designed a double car which is shown in the accompanying engraving.

This car has drop frames similar to those used in bicycle construction and is worked in much the same manner as a bicycle. The front forks and handle bars are merely for supporting the operators; handle bars and seat posts are adjustable. The wheel rims are 17 in. diameter, of steel; the hubs also are of steel. The entire car is fitted with ball bearings designed especially for this machine. The frame is made from Shelby tubing with steel drop forgings at the joints. The finish is black enamel. The double car, shown, weighs but 68 lbs.

The Imperial Minister of Ways of Communication of Russia to Visit the United States.

Major J. G. Pangborn, President of the World's Transportation Commission of the Field Museum, has sent us information from St. Petersburg regarding the proposed movements of Prince Hilko, Imperial Minister of Ways of Communication of Russia, who started by special train from that city on Aug. 10 for the United States via Siberia. The prince will proceed by train, post-horse and steamboat through Eastern Russia and Siberia to Vladivostok. From there one of the new cruisers of the Russian Navy will take him to Japan and thence to San Francisco, where his arrival is expected about Oct. 1.

As Minister of Ways of Communication, Prince Hilko not only has supervision and control over all the railroads of the Empire, private as well as government,

administering the latter and regulating the former, but has equal authority over the navigable waterways on which there are both governmental and private steamboat lines.

The rivers of Russia, as a whole, are many and of vital importance in the intercommunication of the empire. Of Siberia this is especially true; but all the Russias are dependent upon the rivers to an extent which cannot be appreciated until one comes to know the country with its unexampled distances. The empire now has, in round numbers, 24,000 miles of railroads, a mileage larger than any other country in the world save the United States and France. There is an aggregate of navigable river



A New Inspection Car.

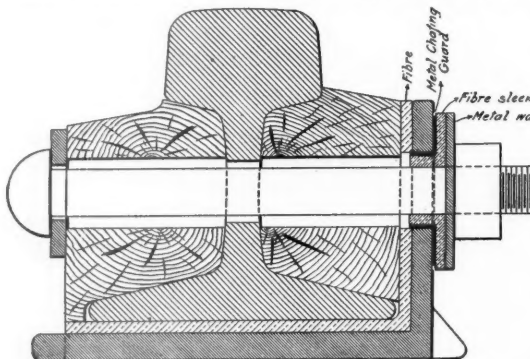
mileage almost if not quite as great, yet, combined, this total of transit facilities plays but a small part in an area of nearly nine million square miles.

The visit of Prince Hilko to the United States is by Imperial command. His purposes are to learn, through personal observation and inspection, of the latest in standard American railroad practice, and of the best in machinery and manufacture pertaining to railroads; likewise, so far as he can, as to steamboat practice, construction and appliances; also, to personally meet those at the head of such operations, and, in short, crowd into the three weeks of his stay all in the way of the practical and instructive that is possible.

Siberia is already rich in gold and silver, and may in the future be demonstrated the greatest section of the world for precious metals. To the Prince it will be interesting to note the handling of the ores and product from the mines to the rails as he progresses over the Rio Grande Western and the Denver & Rio Grande from Ogden to Denver, making a stop occasionally at the leading mining towns.

In view of the agitation and discussion in Russia over the question of light railroads, narrow gage and less expensive construction than is necessitated by the present standard of 5 ft., the narrow or 3-ft. gage system of the Denver & Rio Grande will doubtless be the subject of an exhaustive report on the Minister's return. Indeed, there will be much in the West to comprehend and report upon, and in many respects the Central Pacific, over which the Prince will pass from San Francisco to Ogden, will enable a striking comparison with the practice followed in Russia on long lines of their traffic.

By the itinerary the Prince will reach Denver Oct. 7, and Kansas City Oct. 9. Thenceforward he will travel every night, and be in a different city each day. For instance, he will be at St. Louis on Oct. 10; Cincinnati,



The Weber Insulated Joint.

Oct. 12; Cleveland, Oct. 13; Chicago, Oct. 14; Pittsburgh, Oct. 15; Altoona, Oct. 16; Philadelphia, Oct. 17; Washington, Oct. 18; Boston, Oct. 19; Buffalo, Oct. 20; and New York, Oct. 21. Thus he will cover the leading centers of railroad, river and lake traffic, as well as manufacturing activity, within the period of his stay, if restricted, as it is feared it must be.

His Excellency is an active and alert man and practical withal. He is decidedly American in his tendencies, having characteristics quite out of the common among is countrymen, and these must in a measure be attrib-

uted to his early experiences in America. He has filled every position in the railroad ranks from riveting boilers, firing a locomotive, braking a train, running a locomotive, acting as conductor, anything and everything that may have been demanded of him, and this notwithstanding his Princeship extends back in an unbroken line to 1300.

The great Siberian Railroad is the especial pride of Nicholas II. When he was Czarovitch he was by Imperial edict made President of it, and he turned the first spadeful of earth at the inauguration of the construction at Vladivostok, and subsequently made the entire journey overland, upward of 5,000 miles of it by horses, from the Japan Sea to the Baltic. When he succeeded to the throne, almost his first official declaration was that he would not relinquish the Presidency of the Siberian Railroad; and there has never been a stated meeting of the Council, which is as the Board of Directors of the Company, either before he became Emperor or since, that he has not attended and taken an active part in the deliberations.

Major Pangborn expects to sail for New York early in September, whence he will proceed to San Francisco in time to meet the Prince upon his arrival. There Major Pangborn will assume the general direction of his movements to insure his making connections and achieving the purposes of his visit.

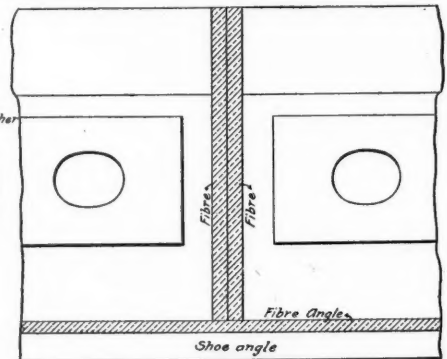
The Weber Insulated Joint.

The Weber Railway Joint Manufacturing Company, of New York, has brought out an insulated joint, which is in experimental use on at least six different railroads. Some of these have had it in use for six months, with excellent results. The joint is shown in cross-section in Fig. 1, and Fig. 2 shows the cutting of the inside angle plate and the insulation between the ends of the rails. It is a modification of the Weber joint, now well known; that is, the principal work of carrying the ends of the rail is done by the steel plate underneath and the wooden fillers. Under the rail is placed a sheet of insulating fiber, which is turned up alongside the outer filler, this being done to keep the fiber from slipping out from under the rail. The insulation of the bolt from the vertical member of the main plate of the jointed is effected by a fiber sleeve, which surrounds the bolt. This, in turn, is protected from wearing against the metal of the joint by a thin metal chafing guard. The construction is perfectly clear from the section given. The claims are long life, perfect insulation and perfect support.

Watertown Experiments on the Rigidity of Track.

As the reader knows, experiments to ascertain the behavior of railroad track under loads have been carried on at Watertown Arsenal for several years. Recently the Chief of Ordnance has transmitted to the War Department a report from the commanding officer at Watertown Arsenal on experiments made on the Chicago, Burlington & Quincy Railroad, at Hawthorne, Ill., with the assistance of Mr. F. A. Delano, Superintendent of Freight Terminals. The experiments consisted of measuring the depression of the rails under the weights of different classes of locomotives and the fiber stresses developed in the base of the rail.

Two weights of rails were experimented on, a 66-lb. section and a 75-lb. section. The rails rested on oak ties on gravel ballast in some of the experiments, in others on cinder ballast. The track selected was in good condition, and the spikes re-driven before the work began. For the purpose of observing the depression of the rails, bench marks were established on a row of stakes driven alongside the rail 31 in. distant from it. A beam carrying a micrometer and an astronomical level bubble was used in observing the depression of the rail, first measuring the height, using a point on the outer flange when the rail was unloaded, and repeating the



observation when the locomotive was in different positions with reference to this point, making the observations when the observed point was directly under each wheel, and when between them midway. This constituted one class of experiments.

In another class a preliminary leveling was made of the entire rail and parts of the adjacent ones; then the locomotive was run on the rail and while in one position the leveling was repeated, thus showing the depression of the entire rail and not the movement of one point, as in the first described experiments.

The comparative rigidity of the track under different weights of locomotives and different wheel bases and pressure on the wheels is shown in the results, as are the behavior of the two weights of rails and the relative supporting power of gravel and cinder ballast.

In one case a tie was removed and the behavior of the rail observed under these conditions. It was found that the roadbed in the vicinity of the locomotive was sensibly depressed, and the bench marks were within the influence of that depression. It was possible to detect a depression of the roadbed as far as 91 in. from the locomotive at the side of the track. A correction for the depression of the bench marks was obtained by means of a cantilever supported 10 ft. from the track, and the total depression of points on the rails was also determined with reference to the cantilevers in some of the experiments instead of using stakes.

The fiber stresses were determined in the base of the rail by measuring the elongation or compression of the metal on a gaged length of 3 in. established on the top surface of the outer flange, observing the strains when the wheels were directly over, or when spanning the gaged length. The computed stresses per square inch, based upon the observed strains, assumed a modulus of elasticity of 30,000,000 lbs. per square inch, and the fibers in the base were strained proportionally to their distance from the neutral axis of the rail.

Advance wave determinations were made on the 66 lb. rail on cinder ballast with engine No. 526, class H, at station No. 10. With the locomotive slowly approaching, an upward movement of the rail began when the leading truck wheel reached station No. 1½. The wave increased while the locomotive continued to advance, and reached a maximum of 0.0037 in. when the truck

a short wheel base where drivers are used alone, and with leading trucks and tenders to the rear of the engine. The disposition of the weights on the wheel base may be found, in confirmation of the present indications, to exert a very sensible influence on the maximum fiber stresses, as well as the gross load on the rail, and exert a modifying influence on the locomotive designs.

Pittsburgh Compound Locomotives for the Lake Superior & Ishpeming.

Four consolidation freight compound locomotives have recently been completed at the Pittsburgh Locomotive Works for the Lake Superior & Ishpeming road. This road is now being built between Marquette and Ishpeming, Mich., for the transportation of the iron ores mined at the latter place to Marquette for shipment, and a number of heavy grades have been found necessary, being in one case as great as 86 ft. to the mile. This fact, together with the heavy loads of iron ore to be carried, makes necessary very heavy, powerful engines, and the Pittsburgh company has designed the locomotives in question to meet those conditions.

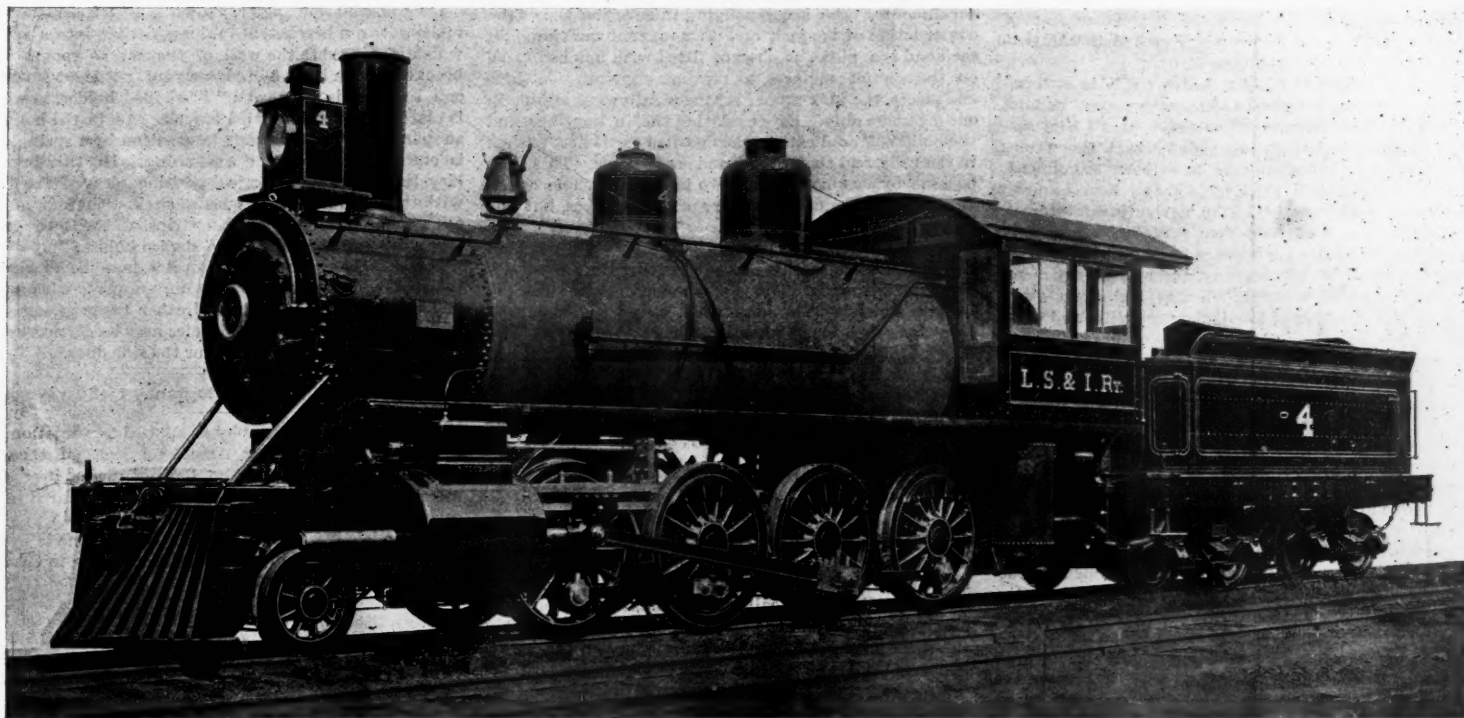
The Lake Superior & Ishpeming has now been completed from Marquette to Negaunee, Mich., a distance of about 10 miles, and work is being rapidly pushed on the remainder of the line. The road, when completed, will be 20 miles long.

We present in this issue an illustration of one of the new locomotives, and a list of weights and general dimensions, as follows :

Fuel	Bituminous coal
Gage of track.....	4 ft. 8½ in.
Total weight of engine in working order.....	147,600 lbs.

to very nearly twelve millions. During the whole half century the North Western has ranked as the premier railway of England—Englishmen would be apt to say as the premier railway of the world—its management, though perhaps erring at times on the side of ultra-conservatism, has been a proverb for enlightenment and absolute integrity, and the quotation of its ordinary stock has never, even in the worst times of panic, fallen below par.

It is perhaps in honor of its own jubilee that the North Western is this month letting off a perfect bouquet of railway fireworks over its birthplace, the original Liverpool & Manchester line. The service between these two great towns has long been of an excellence unapproached either in England or elsewhere. There are three competing routes, the original North Western line, 31½ miles in length, the Cheshire lines route, belonging jointly to the Midland, Great Northern and Manchester, Sheffield & Lincolnshire, 34 miles long, and a comparatively new Lancashire & Yorkshire route, 36 miles long. For some years past it has been understood that the time by all three routes was the same, namely, 45 minutes, and that between, say, 8 o'clock in the morning and 8 or 9 in the evening, each of the three routes had an express train every hour in both directions. The trains of the North Western left at the even hour (8, 9, 10, etc.), while those of the other two routes, whose stations, both in Liverpool and Manchester, are at a considerable distance apart, started at the half-hours. Since July 1, however, the North Western has reduced the time of its trains leaving at the even hours to 40 minutes, and put on a whole bevy of new trains at intervening times, accomplishing the journey in the old standard time of 45 minutes, or a few minutes more. Between



Compound Consolidation Locomotive for the Lake Superior & Ishpeming Railroad.

Built by the PITTSBURGH LOCOMOTIVE WORKS, Pittsburgh, Pa.

wheel was over station No. 5 $\frac{1}{4}$. Then followed a sudden depression, and the height of the rail was reduced to the normal level when the truck wheel was over station No. 6. The trial was repeated, with the result of showing the first effect to be when the truck wheel was over station No. 1 $\frac{1}{4}$, as before maximum height, 0.0034 in., when the truck wheel was over station No. 6 and reduced to the normal height at station No. 6 $\frac{1}{4}$. The distance from station No. 10, the place of observation, to the locomotive when the upward movement of the rail began was 15 ft. in each trial. When the crest of the wave was reached the locomotive was 9 ft. and 8 ft. on the first and second trials, respectively, away from the station, and when the rail was reduced to its normal height the locomotive was 8 and 7 ft., respectively, distant from the station of observation. The position of the locomotive when the upward motion of the wave first reached the station could be identified with considerable precision, but owing to an appreciable interval of time being necessary for the level bubble of the measuring instrument to stop and reverse the direction of its movement, the position of the crest of the wave as well as the time when the height of the rail was returned to its normal level, could not be so well defined. The wave length was probably somewhat less than the observations showed.

The abruptness with which the direction of the wave motion was changed and the rail returned to its normal level, after which, of course, it was depressed below the normal, was a very striking feature in the observations.

With conditions so variable it is difficult to arrive at refined conclusions from the data furnished by so few tests, but the indications make it appear disadvantageous to allow an abrupt termination of the load on the rail. It is expected that additional tests will be made for the purpose of showing the relative severity of

" " on drivers.....	132,800 lbs.
Driving-wheel base of engine.....	15 ft. 6 in.
Total " " and tender.....	23 ft. 6 in.
Height from rail to top of stack.....	52 ft. 9 in.
Cylinders (high pressure), diameter and stroke.....	20 x 28 in.
" " low " " " ".....	31 x 28 in.
Slide valves.....	Richardson balanced
Piston-rods.....	Steel, $\frac{3}{4}$ in. diam.
Type of boiler.....	Straight
Diameter of boiler at smallest ring.....	64 in.
" " back head.....	67 in.
Crown sheet supported by radial stays.....	$1\frac{1}{2}$ in. diam.
Staybolts, 1 in. diameter, spaced 4 in. from center to center.....	
Number of tubes.....	240
Diameter of tubes.....	14 $\frac{3}{4}$ in.
Length of tubes over firebox sheets.....	14
" " firebox, inside.....	108
Width " " " ".....	42 $\frac{1}{2}$
Working pressure.....	180 lbs.
Kind of grates.....	Cast iron, rocking
Grate surface.....	31.78 sq. ft.
Heating surface in tubes.....	2,019.5
" " firebox.....	148.6
Total heating surface.....	2,198.1
Diameter of driving wheels outside of tire.....	56 in.
" " and length of journals.....	8 x 8
" " of truck wheels.....	36
" " and length of journals.....	9
Type of tank.....	Level top
Water capacity of tank.....	4,000 U. S. gallons
Fuel " " " ".....	780 cu. ft.
Weight of tender with fuel and water.....	76,200 lbs.
Type of brakes.....	Westinghouse American automatic

Railroad Matters in Great Britain.

The North Western Jubilee.—On the 16th of this month the North Western celebrated the jubilee of its formation by the amalgamation of four independent companies, the Liverpool & Manchester, the Grand Junction, the Manchester & Birmingham and the London & Birmingham. In the course of the fifty years the mileage of the undertaking has increased from 502 to 1,883 miles, the capital from 18 to 105 millions of pounds sterling, and the revenue from slightly over two millions

Liverpool and Manchester the service is now accordingly as follows:

		Company.	No. of trains.
(1) Liverpool to Manchester:			
In 40 minutes.....	{	L. & N. W.	12
		Cheshire Lines.	2
			14
In 45 minutes.....	{	L. & N. W.	4
		Cheshire Lines.	13
			31
In 50 minutes.....	{	L. & Y.	14
		L. & N. W.	3
			48
(2) Manchester to Liverpool:			
In 40 minutes.....	{	L. & N. W.	11
		Cheshire Lines.	2
			13
In 45 minutes.....	{	L. & N. W.	7
		Cheshire Lines.	13
			34
In 47 minutes.....	{	L. & Y.	14
		L. & N. W.	1
In 50 minutes.....	{	L. & N. W.	4
			52
Total.....			100

In other words, 100 expresses *per diem*, taking no account of trains occupying more than 50 minutes on the journey or of those that only run on certain days in the week. Could George Stephenson have desired better monument to his memory?

Accident Statistics.—The current number of the official number of the Prussian *Archiv für Eisenbahnwesen* contains an interesting article dealing with safety on the Prussian State Railways. Without attempting to decide whether it be the Prussian or the English railway statistics which are obnoxious to the criticism, I cannot refrain from recalling the cynical English saying that there are three ascending degrees of falsehood, "lies, damned lies, and statistics." Says the writer in the *Archiv*, Herr Blum, "the diagrams show that passenger safety, when compared on the basis either of the number of passengers carried or of the number of train miles run, is very much greater in Germany than in Eng-

land. In the 15 years under comparison the accidents per 1,000,000 passengers were in Prussia 0.52, in Germany 0.61, and in England 2.22, etc., etc."

Turning, however, to the tables given by Herr Blum as supporting this statement, I find that per 100 kilometers of line open there were last year in Germany 8.21 accidents, in Prussia 8.13, in England 3.69; per 1,000 train-kilometers there were in Germany 10.27 accidents, in Prussia 9.70, in England 2.32. Of course I have no wish to deny that other tables in Herr Blum's article tend in an opposite direction and appear to justify the statement which I have already quoted from the author. I think, however, careful perusal of his statement, side by side with the official documents issued by our Board of Trade, will lead every impartial person to the conclusion that the accident statistics in the two countries are compiled on so very different a basis that a fair comparison between them is practically excluded. Indeed, in one place in his paper Herr Blum seems to admit as much himself. On page 666 he writes, "A comparison between the German and English situation in reference to the number of accidents is impossible because the calculations are made on a different basis," and again, "For these reasons the increase or decrease of accidents can only be brought into comparison in each country separately."

Herr Blum will no doubt appreciate the satisfaction with which an Englishman taking this test finds that, whereas, with all the praiseworthy efforts of the Prussian Government in the direction of greater safety, the accidents in Prussia have only decreased in 15 years from 10.17 to 8.13 per 100 kilometers of line open and from 15.02 to 9.70 per 1,000 train-kilometers, the corresponding decreases in England are from 10.50 to 3.69 and from 7.71 to 2.52; or, taking separately the figures for collisions as representing results more especially due to preventable causes, while Prussia has fallen from 2.49 to 0.79, that is slightly more than one-third of the number at the commencement of the period, in England the drop is from 0.43 to 0.11, that is to only slightly more than one-fourth.

Light Railways.—The Light Railway Bill is still before the House of Commons and there are even rumors that the Government may fail to pass it at all this session. Meanwhile the only new point is that the names of the proposed Commissioners have been announced. They are, as Chairman, the Earl of Jersey, a well-known and trusted representative of the agricultural interest, formerly Governor of New South Wales, whose only connection with railways appears to be that he is a director of a small Welsh company, and as ordinary members Mr. Fitzgerald, a lawyer who has had great experience in the drafting of Parliamentary bills, and Colonel Boughiey, an officer of the Royal Engineers, who to distinguished military services adds considerable experience both in the construction and management of Indian railways. The two former members are unpaid, the third receives a salary of £1,000 a year. It is no reflection either on the character or capacity of the Commissioners named to say that the Commission would be stronger if it possessed some actual practical knowledge of the traffic management of railways in England as well as in India.

Thousand-Mile Tickets.—With its usual enterprise the North Eastern Company has just commenced the issue of thousand-mile tickets. The conditions under which these tickets are issued, already reported in your columns, are based on a careful study of the regulations in force and the results attained not only in Holland and Baden but also in America. In order to prevent the habitual use of the tickets for short suburban journeys

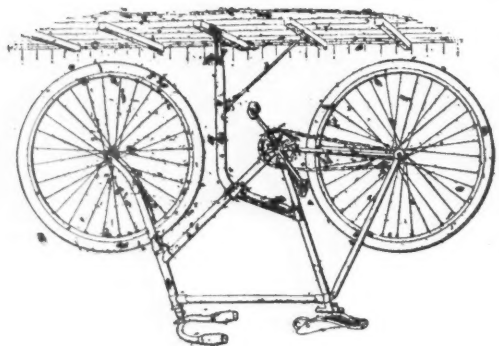


Fig. 1.—Overhead Bicycle Support.

it is provided that the minimum number of coupons withdrawn from the book for any given journey shall be 10. This innovation has attracted considerable attention in the newspapers but it is of course too soon to say how much use has actually been made of it.

The Glasgow Central Railway.—One of the most important and expensive city railways in the world, the Glasgow Central, is now practically complete. The line, out of a total length of 7 miles, has 5 miles in tunnel and of this distance the larger portion had to be constructed by the method known here as "cut and cover" under the principal streets of Glasgow, and in many places through beds of sand saturated with water from the adjacent river Clyde. What the line has cost is not publicly known, though it is freely asserted that had the great company responsible for its construction, the Caledonian Railway, known at the outset what the cost would be, the enterprise, which has taken seven years to carry out, would never have been commenced. It has, however, been publicly stated that the preliminary work

of diverting and reconstructing the sewers, gas and water mains, electric conductors, etc., involved an expenditure of about £300,000. Whatever be the result to the shareholders, there can be no question that the 700,000 inhabitants of Glasgow will benefit largely by the new line, which will not only relieve the congestion at the Central Station, but also enable new suburban services to be worked across and round the city in several directions.

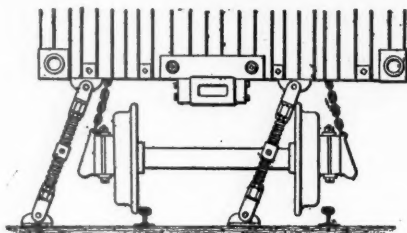
W. M. ACWORTH.

LONDON, July.

The Pearson Hub Car-Replacing Jack.

The Pearson Hub Car-Replacing Jack is a comparatively new device put on the market by the National Jack Company of Boston, and after considerable experience, many railroad officers testify to its efficiency.

The special feature of this jack is that it hoists and



Pearson Hub Car-Replacing Jack.

pushes sideways at the same time, thus greatly helping the work and shortening the time of replacing cars after derailments. The accompanying illustration shows the construction of the jack and its manner of working. At each end is a piece, as shown, fitted with notched teeth on the contact surfaces to prevent slipping. To these end pieces, the jack proper is hinged, allowing motion in one direction only. By regulating the inclinations and the points of application, the derailed car is first pushed to the rails, and then raised and set in place. This may be done by two men, using two jacks, the whole operation requiring, under ordinary circumstances, but one resetting of the jacks.

The National Jack Company has issued an illustrated circular describing this jack, and giving time results of several trials made. The jack is made in three sizes, the largest, which is 28 in. long when closed and weighs 85 lbs., being used for steam railroad work. This largest size hoists 14 in., the right and left screw is 2 in. in diameter, with two threads to the inch. One complete turn of the screw raises the load 1 in., and three full turns will push the car 1 ft., laterally. The two smaller-sized jacks weigh 60 and 30 lbs. respectively, and are intended for street-railroad use.

River and Harbor Work.

On June 30, Secretary of War Lamont issued orders for the immediate execution of the provisions of the last River and Harbor bill, with the exception of those sections providing specifically for the making of contracts for the completion of the more important works. All of the work provided for in this bill is under the supervision of General Craighill, Chief of Engineers.

Since Secretary Lamont's order was issued the Division Engineers, in immediate charge of the improvements, have prepared specifications for such of the work as is to be done under contract. Bids have been invited for the work to be done at Philadelphia and some other proposals for all the improvements to be carried on under the order will be invited shortly. Following is a brief summary of the improvements which it is expected to have under contract this season:

The work in and around New York harbor will include considerable dredging and cribwork revetment in the Harlem River; the construction and repair of dikes in the Hudson River; at Bay Ridge the improving of the harbor channel to secure a uniform mean depth of 26 ft.; at Hell Gate, in the East River, a reef will be removed which lies directly in the usual path of vessels.

At Buffalo, N. Y., contracts are authorized under the continuing contract system to the amount of \$3,200,000. This is to be expended in extending the breakwater, contracts for which will probably be let this year, although work may not begin until next spring. At Dunkirk, N. Y., the breakwater is to be extended, and the harbor basin to be dredged. The contracts will be let this year, but work will not be begun until next spring. At Tonawanda, N. Y., the harbor will be dredged to 18 ft., and the channel between Niagara Falls and Tonawanda will be dredged to a uniform depth of 12 ft. At Erie, Pa., a new survey of the harbor ordered by the Act of June 3, 1896, is now in progress. A contract has been let for dredging the entrance channels and riprapping the north pier at a cost of about \$7,000.

At Bar Harbor, Me., the building of the breakwater will be continued west from Porcupine Ledge, and in Lubec Channel, Camden Harbor and Belfast Harbor, Me., considerable dredging will be done. In Narragansett Bay, R. I., a deep channel is to be dredged from Providence to the ocean, \$700,000 having been appropriated for the purpose.

At Baltimore, Md., the ship channels leading to Chesapeake Bay will be dredged to a depth of 30 ft. at mean low water, as far as the appropriation of \$450,000 will accomplish it. In the Delaware River, at Philadelphia,

the canal is to be dredged at Cherry Island Flats, and the building of the Delaware breakwater is to be continued. Bids have been advertised for both of those latter works.

Bicycle-Holders in Baggage-Cars.

Two new devices for carrying bicycles in baggage-cars and holding them in baggage-rooms have recently been introduced by Geo. E. Bierbach & Co., of Milwaukee, Wis., and have been used with much success on the Chicago, Milwaukee & St. Paul.

One of these devices, shown in Fig. 1, consists of an "L"-shaped malleable iron supporting bracket about 28 in. in height, the lower arm of which is provided with two pivoted "V"-shaped holders, in which the bicycle frame is held. The holders are pivotally supported on the lower part of the arm, and automatically adjust themselves to the diverging frame rods of the bicycle. A single spring retains the holders in their proper position, so that they are always ready to engage the frame rods. These holders are cushioned with rubber, to prevent the frame from being scratched. The bicycle is thus held by its frame, in an inverted position, and when fastened to the ceiling of the cupola of baggage cars, men of average height may walk underneath. The bicycles supported in this way are up out of the way, thus utilizing space heretofore unused, and saving floor room. It is claimed that in a car equipped with this device, bicycles may be carried and handled as conveniently as any ordinary piece of baggage, and that there is no chance for a bicycle to become scratched or damaged. It is also claimed that time will be saved in taking out bicycles, which, under the present system of stacking, often become tangled together.

The other bicycle holder, shown in Fig. 2, consists of a malleable iron bracket, 31 in. long, fitting into a socket which is secured to the wall of the car or room. This bracket or arm has a 6-in. downward curve at its outer end, to which is attached a "V"-shaped holder, in which is placed the frame of the bicycle. As in the hanging support, this holder is kept in position by a spring, and is cushioned to prevent scratching. By this bracket bicycles are held in a vertical position, clear of the floor, with the bottom of both wheels against the side of the car or room, between wooden strips, and with the front lower tube resting in the "V"-shaped holder.

In a 60-ft. baggage car, 40 bicycles may be carried in the roof by means of the hanging support, without interfering with the handling of other baggage, and in a car of the same length 66 bicycles may be carried by the wall bracket, allowing 20 ft. for the side door.

The Application of Photography to Surveying.

An article on photography as applied to surveying, by John S. Dennis, Member American Society Irrigation Engineers, was read at the Denver meeting of that society on Sept. 10, 1894, and has since appeared in the quarterly of the society.

The article treats mainly of the surveys made by the use of photography in the Rocky Mountains, in Canada.

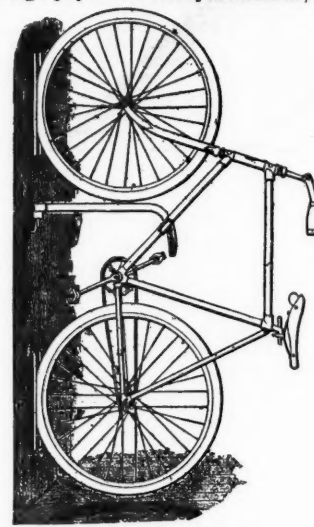


Fig. 2.—Bicycle Bracket.

This method was adopted and is still continued on account of the rapidity and cheapness with which it can be carried on, thus giving an advantage over the ordinary methods of topographical surveying in mountainous countries.

The method is based on the fact that a photograph taken with a suitable lens is a true perspective, in which the focal length is the distance line. By drawing the horizon and principal lines, all the measurements usually taken on the ground may be obtained from the photograph. There is, however, this difference, that while with the ordinary surveying instruments the topographer is restricted to a few constructions, photography affords a great variety of processes by the application of the inverse laws of perspective.

The surveys described are made by a party consisting of the topographer, one assistant, a packer and a laborer, and the area covered by such a party in one season is about 500 sq. miles. On account of the deep snows in that part of the country, the field work can be carried

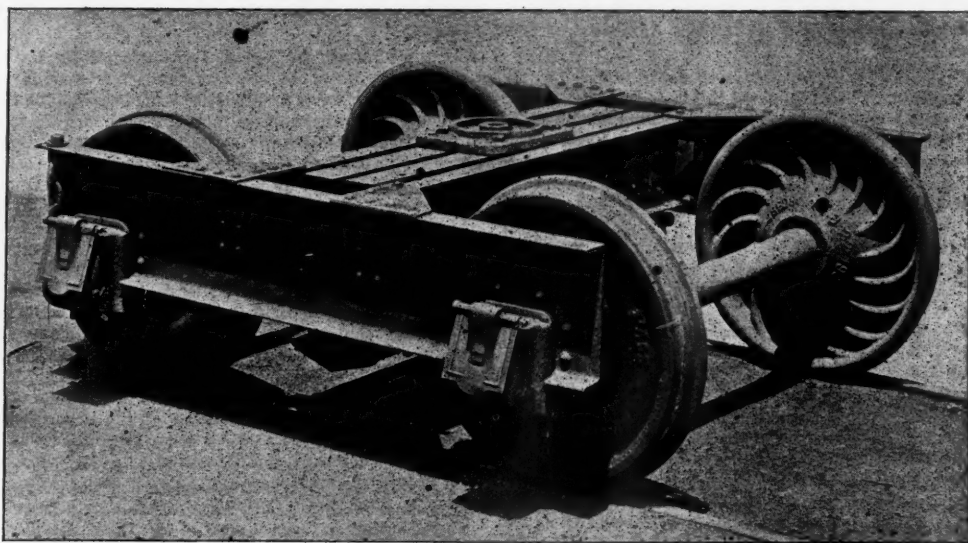


Fig. 1.—Buckeye Freight Car Truck.

on only between the months of June and October, the remainder of the year being spent in plotting the surveys. This plotting is done rapidly, owing to the numerous processes based on the laws of perspective which may be used by the topographer. It is done on a scale of 1 = 20,000. Mr. Dennis gives considerable data for the cost of this method of surveying, and calculates the cost in the district described, the Rocky Mountains in Canada, to be \$7.42 per square mile, an extremely low figure when compared with the expense of ordinary topographical surveying.

The Buckeye Freight-Car Truck.

We show in this issue two new steel freight or tender trucks as made by the Buckeye Engine Company, of Salem, O., under patents granted to Mr. A. K. Mansfield, of the above company.

Fig. 1 is an engraving made from a photograph of a truck which has been in service several months, while Fig. 2 shows the detail drawings of the same truck. The drawings of a similar design are shown in Fig. 3. The main difference between the two trucks is that in the one shown in Figs. 1 and 2 the side frames consist of channels, while that shown in Fig. 3 has side frames of pressed steel. The main object of these designs, aside from the substitution of steel for wood, is the utilization of commercial shapes to as great an extent as is practicable, to avoid the necessity of providing expensive machinery to press the large parts to shape. It will also be noticed that the trucks are, in principle of action, similar to the well-known "Diamond Truck," having rigid bolsters which rest directly on springs, supported by the truck frame. This makes it convenient to use any of the arrangements of spiral or elliptical springs, commonly employed on such trucks. As will be seen from the detail drawings, no spring plank is used, but the springs rest on spring platforms, which are formed of angle irons and channel bars.

In the form of truck represented by Figs. 1 and 2, the side frames are formed of 15-in. channels, 33 lbs. per foot, having recesses formed near their ends to receive the oil boxes. The transom is made of 12-in. channels, 25 lbs. per foot, and the bolster of a pair of 10-in. "I" beams, also 25 lbs. per foot. It is claimed that this form of truck can be produced or repaired with only the facilities

afforded by an ordinary railroad shop, from the fact that only a few small parts must be shaped hot.

In the form shown in detail in Fig. 3, the side frame is either a pressed piece, or it may be built up of a sheet with angle irons riveted to its edges. The main object of this form is to utilize the M. C. B. standard oil box

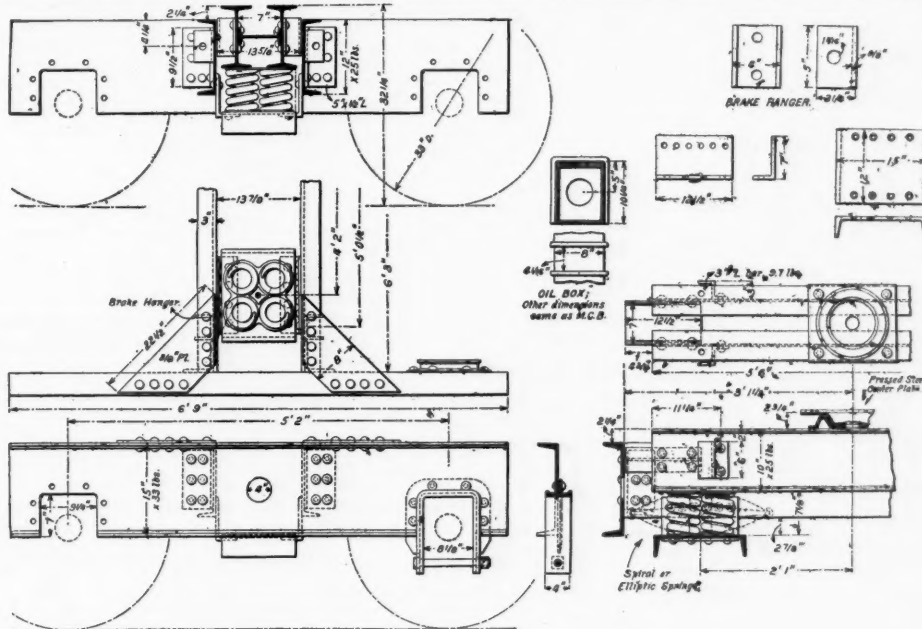


Fig. 2.—Steel Frame for Buckeye Freight Car Truck.

without change and to retain the general appearance of the diamond truck.

These trucks weigh somewhat more than steel trucks, having no bolster, in fact, nearly as much more as the weight of the bolster, but, on the other hand, an advantage is claimed in the use of any of the ordinary nests of spiral or elliptical springs, and the suspension of the

brakes from a rigid part of the truck, as well as the facility in renewal of any of the details, all parts being obtainable in the open market. The weight of the finished truck frame, represented by Fig. 2, is 1,480 lbs. For purposes of comparison with the weights of other trucks, to this amount should be added the weight of the center plate, side bearings, springs, oil boxes, wheels, axles and brakes. The riveting is thoroughly done, and a large number of rivets are used, thus making the entire frame outside of the bolster, to all intents, a rigid piece, capable of withstanding the strains of legitimate service. All parts are calculated, and are found in service to be amply strong for an 80,000-lb. load.

Buffalo Meeting of the Society for the Promotion of Engineering Education.

The fourth annual meeting of the Society for the Promotion of Engineering Education was held in Buffalo, Aug. 20-22. Below is given a condensation of some of the papers which were read by members, and of the discussions which followed them.

The Seminar Method of Instruction as Applied to Engineering Subjects.—By F. P. Spalding, Cornell University.

The Seminar Method consists in having the student investigate a subject in the library under the direction of the teacher, arranging the results neatly and systematically for reference, and perhaps preparing papers to be read before the class. This method has a limited application only in undergraduate work and is inapplicable to fundamental subjects, but may profitably be applied to certain professional subjects given near the end of the course, the subjects chosen being taken up somewhat more fully than is possible for others. The subject se-

lected is of minor importance; the investigation of its fragmentary literature should be made as complete as possible, and the student advised as to the best methods of finding what he needs, and arranging his results to admit of ready reference and easy expansion in any desired direction. The object should be not special knowledge of the subject so much as an appreciation of the scope of the literature of engineering as well as some facility in its use.

In the discussion it was urged that the system was better applicable to small classes, and of especial value in post graduate work; it was thought that the student learns in this way as in no other to connect the steps of a problem, in a way similar to that necessary in actual practice. The system is applicable to bringing results of laboratory work before a class. Successful modifications of the system in use are lectures to the class by students and reading clubs largely devoted to reviewing engineering periodicals.

On the Desirability of Lectures on the Ethics of Engineering.—By C. C. Brown, Indianapolis.

The profession of engineering is young, and proper recognition of its dignity has been retarded by ignorance of its value and noble character. Rather than a trade or handicraft, engineering is one of the learned professions, dignified and valuable to the community. The profession suffers from the existence of many self-styled engineers, who lack capacity and knowledge, from the large amount of engineering work to be done, and the ignorance of the public as to the necessary qualifications for an engineer. More care is essential in choosing an engineer than in choosing an attorney. The East understands this better than the West. The many technical graduates are improving the personnel of the profession, but many retarding factors remain. The failure in many cases of the ambitious graduate to secure adequate financial return leads either to withdrawal from the profession or the adoption of some side line where technical education is of some value. The low prices accepted by incompetent engineers and others, and the ignorance of the public, render necessary a proper understanding of

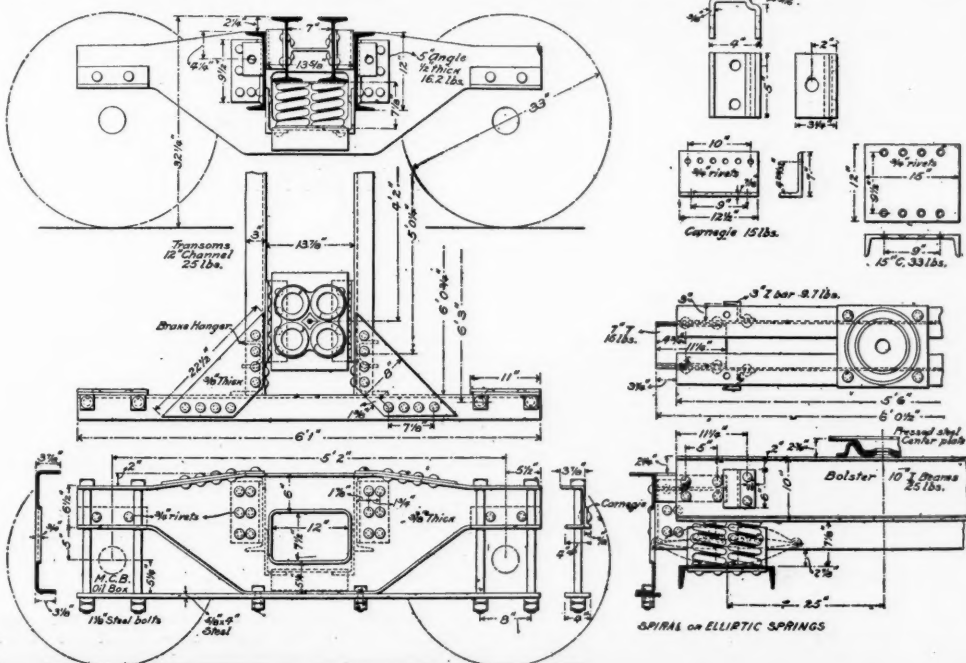


Fig. 3.—Steel Frame for Buckeye Freight Car Truck.

the principles of ethics and the value of the profession technically and financially. Lectures on the standing of the profession, the duties of engineers to themselves, their brother engineers, their clients, and the public, will justify the time necessary for them. Proposed codes of ethics have interested few. Many despair of anything better. Lectures to undergraduates may be given with little loss from other subjects, and will give hope and breadth to the hearers. These lectures must in general be given by engineers in business, who have had contact with all classes of clients. A written code will probably be unnecessary, but some measures should be taken against the inroads of incompetent aspirants for preferment.

The discussion showed both that there was some demand for such a course, and that something was already being done in this line in many colleges of engineering. It was thought by one speaker that social position was a factor in preventing engineers from accepting inadequate payment for services, and that the social side of the young engineer should be developed. An incident was related of an engineer who refused a position of chief engineer at an inadequate salary, while willing to remain upon the same railroad as locating engineer at the same salary, which he thought adequate for that position.

The Study of Modern Languages in Engineering Courses.—By T. M. Drown, President of Lehigh University.

It is recommended that modern languages be taught students having had one year's preparation in grammar by instructors in the department in which they are studying. He thinks that it is important that the teacher of German in engineering courses should know both the language and engineering and that a chemist should teach chemical students. He speaks of his own success in teaching students to read chemical books and journals in German with ease and confidence. "Scientific readers"—collections of general scientific and technical articles by well-known authors—have no advantage for the technical student over books of general literature in modern languages. In advocating this method of teaching German and French in technical colleges, the author is merely aiming to accomplish an important practical end in the shortest possible time. The instruction in modern languages and literature, with the object of interesting students in the humanities and broadening their views of life and its activities, is an entirely different matter. This instruction should, of course, remain with the department of languages, and the more time that can be devoted to it the better it will be for the student of engineering.

The discussion indicated some difference of experience as to success in reaching practical results with technical subjects in French and German. It was thought by some that success depended upon the introduction of technical language work late enough in the course so that the student had already acquired the requisite technical knowledge. The opinion was expressed that a practical course in the language teaching technical work was of more value than instruction, teaching mainly the structure of the language.

The Method of Teaching Perspective to Engineering Students.—By H. S. Jacoby, Cornell University.

Five methods of perspective are briefly described. The method recommended is that which applies most completely the principles used in orthographic projection, a subject which is included in some form in the curriculum of all engineering colleges. In this way not only is the necessary time materially reduced and the number of auxiliary lines reduced, but the different steps in construction are rendered more interesting to the student, and of higher value as training. The usual order of presentation in text books is not regarded favorably, preference being given to a series of simple and carefully graded problems involving initial and vanishing points, points of distance, lines of measure, etc., in regular order, as well as the principles of orthographic projection, logically arranged. This scheme has been worked out in detail, tested in the class-room, and found to give better results than the usual methods, and with less waste of energy to students and instructors.

The discussion showed that the method met with approbation.

Biology for Civil Engineers.—By G. C. Whipple, Boston Water Works.

The engineer must deal with substances subject to the laws of chemistry and biology, and should understand something of the laws governing matter in the living state. Sanitary biology treats of micro-organisms in their relation to the public health. It includes the study of bacteria and the larger forms known as "microscopical organisms." Recent improved methods of biological analysis are of great value to engineers, particularly in water supply and sewerage, both in theory and practice, as well as in the storage of water, and have increased our knowledge of the cause of bad tastes and odors. The engineer who must carry out sanitary reforms and supervise the work should be broadly educated, and for this a knowledge of biology is essential. Instruction in biology for engineering students, in addition to lectures, should include laboratory work sufficient for the understanding of methods of analysis, and to secure familiarity with the use of the microscope. Opportunity should be given for original investigation, in which the field of sanitary biology offers very interesting problems.

The paper was briefly discussed.

Quantity versus Quality in Smaller Colleges.—By Albert Kingsbury, New Hampshire Agricultural College.

Many small colleges admit students under low requirements. These students exhibit wide differences of preparation and ability. The number of instructors is small, and the course frequently less comprehensive and thorough than in larger colleges. To remedy the difficulty, it has been proposed to raise the entrance requirements and the standard of scholarship. Exceptional ability in the small teaching force would be necessary to conduct a course equal to that of the larger college. The plan would exclude many deserving students who lack suitable preparation. Another plan is to cover thoroughly a smaller number of studies. Some students could pursue at a larger college a course of graduate study, for which they would be well prepared. All graduates would have at least the benefit of thoroughness in the work undertaken. The incompleteness of the course would, however, more than offset the advantages. The average small college makes the best use of its abilities and opportunities by presenting, as it does, a course in engineering which includes all the principal topics recognized as essential to such a course. The standard of scholarship may be raised when increased means permit.

The paper was discussed sufficiently to indicate the interest felt in the subject; the importance of thoroughness under any circumstances was urged.

Modeling as an Aid to the Teaching of Machine Design.—By G. W. Bissell.

The purpose of this paper is to lay before the members of the society a method which the author uses in his classes in designing, to facilitate the work. The method consists briefly in the employment of a plastic substance, such as modeling clay or wax, for quickly producing forms of machine parts, which are not readily comprehended from drawings or sketches, and of which actual examples are not at hand. The author has found that there are many cases in which the pencil and the tongue are not equal to the task, and believes that others have the same experience to a certain extent. The models are not always made to scale. Modeling clay lends itself to the work required of it. Its color is suited to machine forms, and thus helps to complete the effect produced by the form given to it. The successful use of clay calls for a certain skill on the part of the instructor, which it is not difficult to acquire.

In the discussion it was argued that the scale of the model was important. Students get a very inadequate idea of the relation of parts or details when different scales are used.

Agreement on Definition of Engineering Terms.—By Thomas Gray, Rose Polytechnic Institute.

Uniformity of form in definitions is undesirable, but the sense which seems clear to the author, is often obscure to readers. Thomson's axiom (second law) in thermo-dynamics is seldom fully appreciated by students or others. There is difficulty often with single words such as strain, stress and many others. Although the technical meaning often differs from the popular, everyday meaning, it is sometimes better to use a well-known word than to coin a new one. Standard engineering works agree fairly well in use of terms. This society could do much to secure uniformity in terms. In popular engineering literature there is greater lack of agreement.

The discussion called attention to certain special cases. The word "unit" has some definite meaning in "unit length," "unit mass," "unit area"; but the terms "unit stress" and "unit strain" are common, in which it has not the same significance. Again, what is meant by a "perch" in masonry? Is it 16½ ft. or 25 ft.? What is meant by "rubble wall"? There is some confusion in the designation of the surface or finish of a stone. There should be some definition to secure uniformity in contracts. A case was also cited where a text book defined volts in terms of amperes, and amperes in terms of volts with no independent or definite basis for either.

An Experiment in the Conduct of Field Practice.—By F. O. Marvin, University of Kansas.

In the University of Kansas, in addition to the work done in term time, field work covering a month's time is given immediately following commencement in each of the first three years of the student's course. The work is a topographical survey, the object being principally the students' benefit, but incidentally the securing of a valuable map of the country surrounding the university. The students work in parties of three, the freshman as rodman; sophomore, as note or instrument man; junior, as instrument man and in charge. The chief of party, from the previous years, knows what is wanted, and is responsible for the planning and conduct of the work. The valuable feature is the placing of responsibility on the student, and the greatest difficulty the necessity of the student earning money in the summer.

In the discussion attention was called to certain modifications where a similar general method was used. In some cases the chief is elected by the students, the computer (who is responsible for checking work) being appointed by the professor in charge. The discipline of learning to obey is good. Some discussion of the general conduct of field work also took place, and the necessity for having class and field work keep pace in some parts of surveying was alluded to, while attention was called to the fact that in some work, such as railroad curves, field work later than class work serves as

review and may to advantage raise unexpected questions at times.

A Course of Study in Naval Architecture.—By C. H. Peabody, Massachusetts Institute of Technology.

In this paper, naval architecture is made to include the engineering of ship building, including both hull and machinery. The subjects common to any engineering course cover the greater part of such a course. The special work should include framing and construction. Questions of form, displacement, stability and strength must be investigated; as also waves, rolling, resistance and propulsion. The use of mechanical integrators should be taught. In connection with propulsion a general problem should be worked out, determining the size and form of a ship for a specific purpose, and this should be followed by the selection of the materials and doing all work necessary for calculating the weight and strength. Rather than to produce an experienced ship designer the training should prepare a young man to intelligently assist in carrying out the directions of the experienced ship designer. Vacation work with shipbuilders is a great aid if such work can be secured.

The Elective System in Engineering Colleges.—By M. E. Wadsworth, Michigan Mining School.

Engineering is a learned profession. There are many non-essential studies in engineering courses. In elective courses the natural sequence of studies must be observed and this prevents disorganized courses, a difficulty often associated with elective courses. Elective gives greater weight to differences in temperament, tastes and abilities. To be successful the elective system must be suited to existing conditions at any school. The success of the institution depends on the chief executive officer.

The discussion disclosed the fact that the general sentiment among the members was not in favor of a system of electives as generally understood. The matter of sequences is insisted upon by the author and the moment you follow the sequence of studies you find yourself forced, you may say, into a rigid course. The system the author speaks of is guarded so that the student cannot choose too one-sided a series of subjects, and while the student is led to believe he is choosing his own course, the professor is doing it for him. In some schools the author would use electives, in certain schools would use the required system.

The Conservation of Government Energy in Promoting Education and Research.—By C. W. Hall, University of Minnesota.

After some introductory paragraphs on the relation of educational and research work to the true functions of any government having for its end the good of mankind, the paper argues the advantages to a people, and particularly to the people of the United States, of government support judiciously applied. The advantages of such support are considered in their relation (a) to the people themselves as individuals, and (b) to the usefulness and power of the Government as the center of national inspiration and influence. Some possible abuses are pointed out; but the source and nature of such abuses leads to the conclusion that they are temporary and not lasting in their nature.

The Hale Engineering Experiment Station Bill.—By W. S. Aldrich, University of West Virginia.

The bill was introduced in the Senate Feb. 27, 1896, by Senator Hale. It proposes the establishment of experiment stations for investigations in the applied sciences and engineering, these to be located at the colleges, which are the beneficiaries of the national endowments of 1862 and 1890. Engineering education is to be promoted by such stations affording facilities for work in experimental lines, and facilities are to be afforded accredited engineers for research. Development of the state's natural resources, and industries dependent will follow much as in the case of agricultural experiment stations. The publication of bulletins and reports detailing the tests, researches and investigations as well as their relation to the state's supervision are matters for discussion as well as the work of the states, the memorials presented and the arguments made.

The discussion which followed showed two distinct opinions especially as to the Hale Bill, which some thought not well calculated to reach the desired result, while others thought that investigation carried on as proposed under government direction would prove expensive, as is usual with Government work. Some thought any money spent directly by the Government should be concentrated, not divided among 44 colleges, many of them weak. Attention was also called to the difficulty of passing this act. Others very distinctly approved of the purpose and general tenor of the act without adopting it in all details. Its purpose is not to create any new colleges but to improve those now existing. Advantages result from the existence of local testing plants. The good results of agricultural experiment stations were pointed out, as well as the fact that government expenditures of this sort were very economically administered.

Is Not Too Much Time Given to Merely Manual Work in the Shops?—By W. H. Schuerman, Vanderbilt University.

Shop work should not be placed in the same plane as drawing, laboratory and field work; the engineer does not himself use hand and machine tools to any large extent, whereas he does have to use some, if not all, of the instruments of drawing room, laboratory and field. It should be restricted to what is necessary for methods and principles and a large part of the instruction should

be given in the class room. All benefits from actual construction, except manual dexterity, can be better obtained, with less expenditure of time, if the work is done outside the school shops, under the partial supervision of the student. Cultivation of the perceptive faculties and training of hand and eye can be better accomplished and with more lasting benefit by a good course of free-hand drawing. Manual training, if deemed essential, should be required for admission and those deficient should have an opportunity to make up the deficiency at a summer school.

The discussion showed that many members gave more time to shop work than the author's minimum. Without real dexterity experience enough to judge a good workman across the shop is of value. Some thought shop work was often carried too far. In different colleges there exists a variation of from 100 to 1,800 hours devoted to shop work. It was urged that the object of the Engineering College is to teach the student those things he will not get elsewhere. Aside from doing work himself, the student gains by seeing work done. Some were tending to lower the amount of time given to shop work.

How to Divide Subjects for Original Investigation Among Different Colleges.—By C. H. Benjamin, Case School of Applied Science.

Unity of action among engineering colleges is desirable to avoid duplication of experiments under conditions such that no benefit will result from the comparison of results, and such that observers are ignorant of what others are doing, and whether their own results will have any permanent value. Experiments made at a small college with limited equipment may be as valuable as those made at the larger laboratory. This society is well fitted to institute a reform, and might appoint a committee to consider the subject, collect data from each college, as to equipment for engineering research and amount of time available, as well as prospective investigations. This committee should be of an advisory character only, and should merely organize the membership without bringing the results of experiments before the society.

In the discussion it was brought out that catalogues of some colleges print lists of these, which form an index to investigations made. Others print results in engineering magazines published by the engineering colleges. Others still issue bulletins for similar purposes. No definite action was taken as to the formation of such a committee.

The Report of the Committee on Entrance Requirements for Engineering Colleges

was full and very valuable. It summarized the opinions of colleges and of preparatory schools as to desirability of uniformity and other points of preparation, including the question of the adoption of the certificate plan. The discussion of the report was delayed until the next meeting, when it could be appreciated to better advantage in print. A satisfactory abstract of this very valuable report can hardly be made in the space available.

A Course in Municipal and Sanitary Engineering.—By Arthur N. Talbot, University of Illinois.

With the growth of population, the necessity for municipal public works has increased rapidly. There is and will be a demand for engineers competent in matters touching the health and comfort of urban communities. While the development and discipline of the student is the first essential, there is opportunity for specialization, touching details, illustrating principles already presented, and starting a student in the line of his future practice. In addition to mathematics, drawing and surveying, as well as general culture studies, water supply, sewerage and road engineering are especially important. These subjects should receive attention in detail; a general glossing over is not sufficient. Some knowledge of chemistry and biology are now essential to some of the subjects noted. Such a course will tend to place city engineering work on a higher plane.

In the discussion it was remarked that in the University of Illinois was the only course distinctly devoted to municipal and sanitary engineering. The fact that in many small cities the work has been done none too well is a reason why there should be a demand for such a course. There is some danger, however, of trying to do many things an engineering college need not do, and perhaps some of the matters specified in the paper are of this sort. A graduate must develop and fit into his environment.

Engineering Education in Japan.—By J. A. L. Waddell, Kansas City.

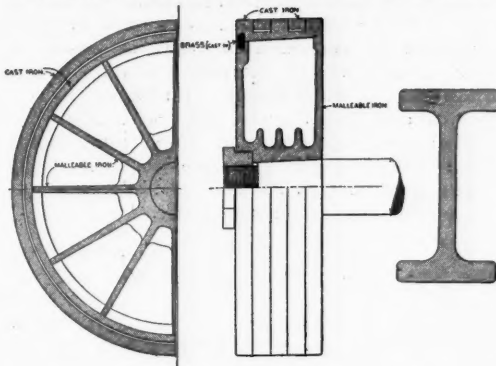
From lack of time, Mr. Waddell presented a substitute in the way of suggestions as to civil engineering education. He advocates: 1. A five years' course; 2. The student to be prepared in non-technical subjects; 3. Technical course to include many allied subjects, geology, chemistry, physics, lithology, etc.; 4. Theoretical courses (as mathematics) increased; 5. Graphicstought more fully and thoroughly; 6. Use of the slide rule; 7. Technical courses to be more extensive and include more completed designs; 8. Small classes. In Japan, where the writer taught the practical side of engineering, teaching was accomplished largely by assigning subjects for reading, the teacher meeting the class, asking and answering questions, so as to bring out the points of the subject. The system was very successful.

The discussion touched altogether upon education in Japan, and the opinion was expressed that the methods

successful in Japan might not be as applicable everywhere. Japanese students are remarkable; they are tremendously in earnest. It was found that other methods than that used by Professor Waddell were also thoroughly successful with these extraordinary students.

Locomotive Counterbalancing.*

The subject of locomotive counterbalancing has recently been quite a favorite one, and there have been many valuable papers on this theme, but most, if not all of them, have been deficient in one particular; in that they have not clearly and simply indicated how to proceed with each part of the problem. For instance, one paper gave very carefully worked out formulae for determining the effect of reciprocating weights, and how to correctly balance them, but the proportion of reciprocating weights to balance was passed by with a mere reference, as though of small consequence, when in reality it should be the fundamental question. In the following it is not the writer's intention to advance new theorems, but to select such points from previous papers (including those by Messrs. Parke and Sanderson, before the New York and the Southern and Southwestern



Figs. 1 and 2.—Locomotive Counterbalancing.

Railroad Clubs respectively) as, with a few logical suggestions, will place the subject in the hands of every Master Mechanic.

In developing these rules, three cardinal points have been borne in mind:

(1) The amount of reciprocating weight that can be left unbalanced may be a definite function of the total weight of the engine.

(2) The total pressure of wheel upon the rail must not exceed a certain definite amount depending upon the construction of bridges, weight of rail, etc.

(3) The vertical influence of excess balance must never be sufficient to lift the wheel from the rail.

The first proposition is based on the assumption that the greater the mass, the greater may be the disturbing force without seriously affecting it, on account of its greater inertia.

The second is evidently a rational deduction, not needing any demonstration.

The third is necessary in order to avoid the wheels jumping off the rail, thereby causing a real "hammer blow."

Starting with the above assumption, we arrive at the following conclusions:

A. Each wheel should be balanced for all revolving weights attached to it.

B. The connecting rod is to be considered as part revolving and part reciprocating weight; the proportion of weight of rod which is to be considered as revolving weight varies with the length of the rod as given below:

Length of rod in feet,	5	6	7	8	9	10	11	12
Proportion as revolving weight,	.57	.55	.53	.52	.51			

C. The part of weight of connecting rod considered as revolving weight, should be entirely balanced in the main wheel.

D. The amount of reciprocating weight that can remain unbalanced without seriously affecting the locomotive may be found by the formula:

$$Wr = \frac{Wt}{360}$$

Wr = unbalanced reciprocating weight on one side (including portion of main rod).

Wt = weight of locomotive in working order.

E. The remainder of the reciprocating weights should

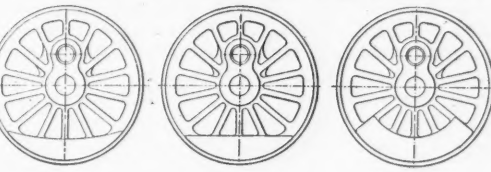


Fig. 3.

Fig. 4.

Fig. 5.

Locomotive Counterbalancing.

be counterbalanced by dividing the amount equally between the driving wheels on the side, provided that the sum of the static weight on any one wheel, plus the centrifugal force of this overbalance, does not exceed the maximum pressure allowed for the particular type of engine in question at the maximum speed at which it will run. If some wheel loads are heavier than others, the lighter wheels may take a part of the overbalance which the heavier wheels cannot without exceeding the specified limit; nor must the centrifugal force exceed 75 per cent. of the static load on wheel.

F. The center of gravity of counterbalance must be opposite the crank.

G. The counterbalance should be brought out from the face of the wheel as far as clearance for the rods and proper design will permit.

* A paper, by Mr. G. R. Henderson, Mechanical Engineer, Norfolk & Western Railroad, read before the Association of Engineers of Virginia, June 27, 1896. From the Journal of the Association of Engineering Societies.

H. The center of gravity of counterbalance should be placed as near the rim as possible, and the weight of the counterbalance reduced by this method.

I. Make reciprocating parts as light as possible.

Section A is self-evident. B is taken from one of the papers above referred to. C comes under the same ruling

as section A. In D the value $Wr = \frac{Wt}{360}$ is taken as representing good practice of the present day. It may be found that some different divisor will be more generally acceptable, but it is believed that the above will give good results.

To determine the centrifugal force for Section E, the following formula is obtained from Weisbach's "Mechanics of Engineering," Vol. I., page 609:

$$P = .00034 u^2 Gr.$$

where

P = Centrifugal force.

u = Revolutions per minute.

G = Weight in pounds.

r = Radius in feet.

Now letting

S = Speed in miles per hour,

D = Diameter of wheel in inches,

we have

$$u = \frac{S \times 5280 \times 12}{3.1416 \times D \times 60} = \frac{S \times 1056}{3.1416 \times D} = \frac{S}{D}$$

and

$$u^2 = 112896 \frac{S^2}{D^2}$$

and substituting,

$$P = 38.4 \frac{S^2}{D^2} Gr.$$

As in most locomotives $r = 1$, then we may put simply,

$$P = 38.4 \frac{S^2}{D^2} G.$$

If now we assume that the maximum speed in miles per hour of the locomotive equals the diameter of driving wheel in inches, then,

$$\frac{S^2}{D^2} = 1 \text{ and } P = 38.4 G, \text{ or say } P = 40 G.$$

It is also necessary to observe the limits of rail pressure. This will be different on various railroads, but on the Norfolk & Western it was taken as follows:

American type of locomotives..... 28,000 lbs. per wheel.
Ten-wheel "..... 26,000 " "
Consolidation "..... 25,000 " "
(These loads are per wheel and not per axle or pair of wheels.)

Referring to Section F, it is found that the displacement of the counterbalance necessary to correct the effect of the weights and balance not being in the same vertical plane is so small on outside cylinder engines that it is accurate enough to place the balance directly opposite the crank. By bringing the counterbalance out as suggested in G it is possible to still more lessen the irregularity explained just above.

Sections H and I need no explanation.

Having taken up these various points, the method of counterbalancing locomotives can now be reduced to the following:

RULE.

Divide total weight of engine by 360, this to be subtracted from reciprocating weights (including proportion of main rod) of one side of engine, and the remainder to be distributed among the driving wheels on one side.

The sum of 40 times the amount of reciprocating weight allotted to any one wheel and the static load on the wheel, must not exceed the specified allowance for rail pressure, nor must 40 times the amount of reciprocating weight balanced exceed 75 per cent. of the static weight.

The weights to be put in each wheel will be inversely as the distance of center of gravity of counterbalance from center of wheel is to the crank radius, and must cover all revolving weights as well as the proper proportion of reciprocating weight.

In order to obtain the best results both for the engine and track, the following points should be remembered:

1. Keep the spread of cylinders as small as possible.
2. Make pistons of malleable iron, wrought iron or steel, to reduce weight.
3. Make piston rods of steel, and hollow.
4. Make crossheads of cast steel, of light ribbed construction.
5. Make the rods of steel and of an I-section.
6. Keep counterbalances near the rim of wheel.
7. Keep counterbalance as far out as possible.

No. 1 can only be done when designing the engine. No. 2 can be accomplished in various ways; however, the single plate pistons have the objection that they freely transmit the heat of steam side to exhaust side of the piston, but double-plate pistons are not readily examined, as they should be, especially when very thin. Besides, a cast-iron wearing surface is desirable, while bolts and rivets are equally undesirable. A design of piston that promises very favorable results, and will meet all the above objections, is shown in Fig. 1. The center is malleable iron, and the wearing ring cast iron, the latter fitting against a shoulder at one side, while a brass retaining ring is cast in and opened out on the other side, making practically a single piece. It also takes ordinary cylinder heads.

For No. 3 the use of nickel-steel has been suggested. No. 4 depends entirely on the arrangement of guides, etc.

For No. 5 Fig. 2 shows the favorite form.

No. 6 may be accomplished as shown in Figs. 3 and 4, in preference to Fig. 5.

No. 7 is limited by the clearance necessary for the rods, etc.

100-lb. Rails.

We find from the last annual report of the Chesapeake & Ohio Railway that this company has now in track 40 miles of 100-lb. rails. The first rails of this weight were laid in the year ending June 30, 1895, at which time the total in track amounted to 20.3 miles. The total of 75-lb. rails now in track amounts to 561.5 miles, an increase of 61 miles over last year. The total of new rails laid in the last fiscal year was 10,000 tons, at a net cost of \$129,223. Many of the old rails were sold at prices ranging from \$15 to \$20 a ton, and the new ones were bought at \$22 a ton, a favorable contract having been made the year before.



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EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

We printed last week some of the most important statistics from the introduction to Poor's Manual of Railroads, covering the year 1895. It seems worth while to give especial attention to a few of the most significant facts collected there. Probably no one but a special student of railroading has any conception of the magnitude of the railroad business of the nation. In 1895 the tons of freight moved amounted to 763½ millions and the tons moved one mile were 88,568 millions. The passengers carried were nearly 544 millions and the passengers one mile amounted to 12,642 millions. The gross earnings were over 1,093 million dollars. This immense freight business was done at the lowest rate ever touched. That is, the railroads received for each ton of freight carried one mile in 1895, 0.839 cent. The returns to the stockholders were less last year than ever before, the dividends having amounted to only 1.59 per cent. The interest paid on bonded debt amounted to 4.25 per cent. The sums invested and receiving these low returns are colossal. The total share capital and indebtedness, exclusive of current debt, amounted at the close of the year to \$11,241,569,658. The increase in year was considerably more than 225 million dollars. Where else in the world does so much money earn so little return? And yet the confiscators continue to delude the farmers with their talk of the tyranny of the railroads.

Mr. Kendrick, the General Manager of the Northern Pacific Railroad, has issued a circular to the employees of that road, which is a novelty in this political campaign. He points out the immense interest which the employees have at stake in the right result; that on the decision at the polls will depend the future prosperity and happiness of millions of wage-workers, and that the question is not only of great importance to every railroad corporation, but that it is equally important to the employees, for their fortunes must vary with those of the railroads. He then states very briefly the principal claims made by both sides, and says that the management of the Northern Pacific does not pretend to suggest how the employees should vote. He simply asks that the employees inform themselves. To that end, the company will furnish the publications of both parties, or of either. Surely this is a fair and candid way of getting at the matter, and shows the faith of the Northern Pacific management in the intelligence and the honesty of their employees. Indeed we must all hope and believe that that faith is not misplaced. If the mass of the voters are not intelligent and honest, the Republic cannot endure. There is no escape from that.

It is hard to see how this circular can be called an attempt to coerce the votes of the men, but probably it will be called so, as is every expression of railroad officers which indicates a wish that their men shall vote like well-informed and patriotic citizens. By the way, what an absurd notion it is that railroad officers are trying to coerce their employees in voting.

That is the very last thing that any officer of sense would try to do. He knows perfectly well that he could not take a more efficient means to make the men vote the way he does not want them to vote. Probably this notion of coercion exists only in the minds of populist editors; railroad men themselves know how preposterous it is. There is, however, one danger in railroad officers taking any part in the campaign, and in the organization of railroad men's clubs, that we must recognize. It is the danger that the farmers shall be led to think that the railroads are organizing and working against their interests; it is the danger of exciting and perpetuating class prejudice. That danger we have long foreseen, and because of it, it has seemed to us undesirable to organize clubs of railroad men; it has seemed to be better that the railroad men should join the clubs of other citizens, or organize clubs with other citizens; in short, take part in civil life, as citizens, and not as a special class. But of course there is another side to the question. It is important to get organization some way and to provide the machinery to distribute literature and to provide for discussion and for all the means which go to inform the voters. So we shall not be surprised if the energetic and enterprising work of the *Railway Age* in promoting the organization of clubs among railroad men does much more good than harm; at least we shall hope so most earnestly.

Rails for New South Wales.

We have been asked by the Secretary for Public Works of the Colony of New South Wales to call the attention of American rail makers to an opportunity to bid for the manufacture of a considerable amount of rails for that colony. Bids for this material will be opened Dec. 30 and they may be addressed to J. H. Young, Esq., Minister for Public Works, Sydney, New South Wales, or to the Agent General for New South Wales in London. The contract will include 150,000 tons of rails and corresponding amounts of steel fish-plates, steel track bolts and steel spikes.

The American bidder is at once confronted with the difficulty that these materials must be made entirely from the products of the Colony of New South Wales. The ore, fuel and all other necessary minerals must be the natural product of, and "raised" in the Colony. Obviously, when we take into consideration the fact that the mineral industry of New South Wales is little developed and that the contract will include some onerous terms, designed to protect the Colony and the workmen, the enterprise must be undertaken with the greatest care. The coal produced in New South Wales in the year 1894 amounted to but 3,672,000 tons, and the coke made was only 34,458 tons. The coal seems to have been sufficient, however, for the colony, as practically none was imported in that year; 47,586 tons of coke were, however, imported. Mr. Rothwell's statistics of mineral industry of the world report no iron produced in the colony during the year. For the four years preceding, the production of iron varied from 2,000 to 4,000 tons a year. He says "none of the Australian colonies is an iron producer, and the efforts made to establish the industry have not succeeded. The iron reported in one or two of them is made from scrap and similar material." Iron and steel were imported in 1894 to the value of \$2,884,765.

It is apparent that the concern which undertakes to manufacture 150,000 tons of steel rails out of iron ore raised in the Colony must begin at the very foundation of things; but the delivery of the rails must begin within 18 months of the signing of the contract, and it is to be spread over a period of ten years, at the rate of 15,000 tons a year. The bidder must state the price per ton at which he will deliver the material and must accompany his bid by a deposit of £5,000. The deposits of unsuccessful bidders will, of course, be returned; but if the first delivery is not made on the date specified, the deposit will be forfeited. The government reserves the right to select from the bidders the one who is, in the opinion of the Minister, most capable of carrying out the contract. The contractor must provide all labor, materials and plant.

The specifications, designed to protect the government and the workmen, are especially minute. The Engineer-in-Chief for Railway Construction is to have constant supervision and he may require the dismissal, within 24 hours, by the contractor, of any agent, overseer, foreman, workman or other person employed on the works. Payments on account of work may be stopped until this dismissal is carried out. The contractor may not sublet work or assign any of the moneys payable to him under the contract. The workmen must be paid at least once a month, in the current coin of the Colony, and no system of payment

by provisions, liquors or goods will on any pretense, be allowed; nor can the contractor, or any employee, establish a shop for the supply of such materials to workmen. Before the payment of any money to the contractor, the engineer may require from him a declaration that the tradesmen, the workmen and the laborers of every class have been paid their claims of every kind in full.

The rails are to be of the familiar flange section used in this country, in appearance quite like the section of the American Society of Civil Engineers. They are to be of 60 lbs. and 80 lbs. weight to the yard, and 30 or 40 ft. long, as required. The ingot must be made from a mixture of the best New South Wales hematite and charcoal speigeleisen. The chemical composition of the ingot is as follows:

Silicon.....	0.10 to 0.15
Manganese.....	0.80 to 1.00
Sulphur (maximum).....	0.069
Phosphorus (maximum).....	0.06
Carbon (80-lb. rail).....	0.55 to 0.65
Carbon (60-lb. rail).....	0.43 to 0.47

Rails of higher or lower carbon will be rejected.

The rails are subject to a drop test of one ton, falling 6 ft. on a piece 3 ft. 6 in. between supports, and the pieces tested must deflect not less than 3¼ in. or more than 4¼. The rail must then endure a blow of 12 ft. without fracture. If more than five per cent. of the rails so tested fail, the entire batch from which the test pieces are taken shall be absolutely rejected.

The fish-plates must be of steel of the same composition as that specified for the rails. They are to be annealed, and to be 31 in. long, punched with six bolt holes. The track bolts are to be of mild steel ½ in. diameter for the heavy rails and ¾ in. for the light rails, the bar from which they are made to stand doubling cold, without fracture. The spikes are to be of the same quality of steel as the bolts and are to be made to drive in bored holes; that is, they are cylindrical in section with blunt ends.

We do not venture to express any opinion as to the probability of bids for this work being made by American houses, but shall be extremely interested to know the outcome.

The Superintendents' Meeting.

The American Society of Railroad Superintendents makes a radical departure this year in holding its meeting at a pleasure resort and in fixing the date a month ahead of that of the convention of the American Railway Association. The members (who go) are expected to take along their wives, and excursions are planned for at least half of the time allotted to the meeting.

It might be suspected that the brevity of the business programme was due to a desire to make the social functions the main feature of the day, but there is no evidence that such is the case; and the subjects, though few, afford an ample field for the profitable interchange of ideas. "Relations with Employees," scheduled for Thursday, is unlimited.

A correspondent has suggested that that subject ought to be taken up beforehand by being discussed in the *Railroad Gazette*. We should be glad to follow out this suggestion, but we are reminded of a little incident that happened in a certain local superintendents' society not long ago. After the reading of an interesting paper on this subject by one of the members, the President, as usual, asked, "Any discussion on this paper?" "It suggests to me," said a member on the front seat, after the usual period of silence, "that the subject is exhausted." Whether he meant that the members had become exhausted, by their ineffectual efforts to contribute something new on the subject, we are unable to say, but there is no doubt that this aspect of the matter frequently presents itself. The fact is that this subject belongs to that class which so skillful and accomplished an essayist as Philip Gilbert Hamerton found it impossible to treat in any formal way. It is embraced in the great art of "living with other people," the rules of which are so modified by exceptions that systematic discussion of them is out of the question. It would be as useless as to run a passenger train all day around the thousand miles of yard track in Chicago or Buffalo, without any passengers in the cars. When you get through you have performed a lot of interesting evolutions, but you haven't got anywhere. The railroad officer's intercourse with his subordinates is not always at such close range as that of members of the same family, or the same crew, or the same office force, but still the principle applies. Hamerton says: "Human intercourse, as it is carried on between individuals, though it looks so accessible to every observer, is in reality a subject of infinite mystery and obscurity, about which hardly anything is known, about which nothing is known absolutely and completely. Any attempt to ascertain and proclaim a

law, only ends, when the supposed law is brought face to face with nature, by discovering so many exceptions that the best practical rule is suspension of judgment, and a reliance upon nothing but special observation in each particular case."

Yet we are not discouraging consideration of the subject. It is not only an appropriate, but should be a profitable, topic for discussion in gatherings of railroad officers, and especially of superintendents, who come in direct contact with a larger variety and generally a larger number of the employees of the company than any other officer.

What is wanted in the way of discussion, however, is *experience*. The presentation of careful statements of the member's own experience, in far greater detail than has hitherto been the fashion, is, in our opinion, the best plan for making the discussion of discipline profitable in a superintendents' meeting. There would be no harm, in most cases, in giving names and figures in open meeting, where such are desirable to more clearly explain an argument or sustain your theory. Anything which it is not expedient to publish can be omitted from the reports, official and other. Accounts of actual experience are needed for the reason, just stated, that generalized statements fit only a small portion of the facts in the hearers' experience. The files of the *Railroad Gazette* for the past few years abound in essays on the subject under consideration, and the substance of a good one appears in this issue; but these are all more or less unsatisfactory because they are too general. The most practical part of Mr. Peters' paper, published to-day, was his invitation to his fellow members to *come and see* the club-house described. The general subject of relations with employees includes, of course, many things which are not material and cannot be seen with the eye, but the narration of experiences embodies the same principle as that of Mr. Peters' invitation.

In the way of carrying out this suggestion, we venture to mention, as a beginning, one point in the report which is to be discussed at Niagara Falls next Thursday, viz., the recommendation of the Fitch Committee that premiums be paid to employees for meritorious service. Let every member state just how much money he has paid out in premiums since that report was published, a year ago, giving all appropriate particulars. We suspect that the stenographer will not be overworked in reporting what will be said, this year, under this head, but it will be well to make a beginning.

One of the most vital and at the same time delicate questions in the relations of Superintendents to their subordinates is the recognition of the brotherhoods, which, from a practical point of view, means grievance committees. Most Superintendents are morally certain, from past experience, that a grievance committee will do more harm than good to its so-called constituents, even when it makes no mistakes; that it is not likely to embody the best wisdom of the employees, and that its mere existence is likely to produce friction where otherwise all would be serene and satisfactory on both sides. This knowledge tempts the Superintendent to try to help his men by breaking up their committee. Sometimes he does this and does good by it. But we doubt whether this is a sound rule to swear by. The possession of the theoretical right to have a committee is a great satisfaction to some men, and once in a while the exercise of their right may be of benefit to them, while the denial of the right, even where no action is taken, tends to irritate them. If a Superintendent makes a mistake and represses an unreasonable committee when it has some real grievance, he may subsequently be surprised by seeing his General Manager accord the recognition which he (the Superintendent) has refused. On principle the brotherhoods are to be encouraged, for the motive which originates them will probably always be active among men working in large bodies; and the problem before the Superintendent is to adhere to the principle while still he is compelled to frown on most of the manifestations of it that he encounters in real life.

Superintendents who hold that they ought not to encourage brotherhoods generally meet their critics by answering that they encourage the men as *brothers*; that is, that all the good that an employees' union can accomplish is realized by the establishment of such unrestricted relations between the Superintendent and the Conductor, Engineman or Station Agent, that all desired justice, consideration, personal interest and friendship shall subsist between the two to the fullest extent. We shall not quarrel with this theory, or dispute about minute distinction of terms. All good Superintendents will advance the interests of the service if they carry out their ideals, and the narration of actual experiences, which we have suggested, will help to that end.

Annual Reports.

Southern Railway.—This report is issued less than two months after the close of the company's fiscal year, June 30. It covers the operations of over 4,600 miles of road, earning over 20 million dollars a year, and a word of commendation is certainly due to the officers for the promptness with which it has been put in the hands of the stockholders (about eight weeks before the annual meeting). The fact that the stock is in a voting trust does not lessen the credit due. Promptness has not been secured by omitting statistics which would aid in judging the company's position. Indeed, the information given is very full and complete, and obviously the aim has been to give all the facts likely to be of value to those interested in the property. But an even more favorable feature of the report is the intelligent setting forth of the information. The President's introduction is a lucid exposition of the year's results and the company's present condition, with explanations of the items included in various accounts. The statistical portion is especially compact, and clearly arranged so that it is a simple matter to study almost any point of interest, either as to the financial condition of the company or the development of its traffic.

The record of the second year of the present company's history, as given in the report, is one of steady growth in every direction. Earnings have increased; tonnage carried and ton-miles are greater, and passenger traffic has grown even more rapidly than freight. The length of line operated is also greater by 263 miles.

The increase in passenger revenue was 21 per cent., and in freight revenue, 14.4 per cent., the former increasing over \$958,000 and the latter \$1,239,000. There were also increases in express and mail, and the total increase in gross would have been shown as much greater but for a change in accounts. The net balances only of engine and car mileage accounts are now shown in the accounts. This year the net payment to foreign companies for freight car mileage was \$132,972 as against \$156,416 in 1895. For mileage of sleeping and passengers the balance against the company was \$75,000 as against \$102,000 in 1895. As it is, gross earnings increased 11.5 per cent., and net earnings 11.46 per cent., over 1895, operating expenses being 70.49 per cent. of earnings in 1896 and 70.48 per cent. in 1895.

The main results for the two years are given below, the average miles operated in 1896 being 4,574, and in 1895 4,139.

	1896.	1895.
Gross earn.....	\$19,082,247	\$17,114,791
Oper. exp. and taxes.....	13,451,448	12,062,854
Net earn.....	\$5,630,799	\$5,051,937
Other income.....	188,508	89,678
Total income.....	\$5,819,307	\$5,141,615
Int., rentals, etc.....	5,267,829	4,245,870
Balance.....	\$556,478	\$895,745

The total credit to profit and loss, June 30, 1896, was thus \$1,452,223. The reorganization plan provided for the issue of a limited amount of new bonds annually for a number of years to enable the company to acquire new property properly chargeable to capital, and the issue of securities under this authority accounts for most of the increase in fixed charges. The small amount not so accounted for is due to the fact that the returns for 1895 do not include the operations of the system, as finally constituted, for the entire 12 months, a number of the lines not being transferred to the new company until September, 1894, and later. This, of course, affects comparisons between the two years in the other items in the table as well, and modifies the apparent increases as shown above.

The line worked on June 30, 1895, was 4,391 miles, and on June 30, 1896, was 4,654 miles. The increase during the year was chiefly due to the acquisition of the Atlanta & Florida, extending 102 miles south of Atlanta, and of the line to Norfolk, Va. This latter line is worked under trackage contracts with the Wilmington & Weldon and Norfolk & Carolina, for the use of the line between Selma, N. C., and Pinner's Point, opposite Norfolk, 155 miles. The through line to Norfolk thus obtained enabled the company to change its deep-water terminus from West Point to the latter city, and steamer connections between Norfolk and Baltimore were immediately arranged for. The establishment of this new line offended the old line on Chesapeake Bay, which was affiliated with the Seaboard Air Line, and a severe rate war ensued, which is still unsettled.

The table of results given above does not, as has been stated, include in the 1895 totals figures for the same mileage as is included in the 1896 totals. But making the proper changes in gross earnings, to secure fair comparisons, we find an increase of \$1,041,000 roughly, or about \$926,000 more than is shown in the table. An increase of \$606,000 is shown in passenger traffic and of \$807,000 in freight traffic. Mail and express revenue was also larger, but miscellaneous income fell off \$393,000, reducing the increase to the \$1,041,000 just given.

A truer comparison is obtained by finding the earnings per mile of road. The report gives statistics of earnings and expenses for six years, for substantially the same properties for the different years, except that in 1896 the returns are for the larger mileage. We find then that the gross and net earnings *per mile* for six years was as follows:

	1896.	1895.	1894.	1893.	1892.	1891.
Gross earn.....	\$4.172	\$4.134	\$3.995	\$4.383	\$4.593	\$4.836
Net earn.....	1.231	1.176	.992	1.189	1.353	1.529

Here we see that the company has still to make considerable gains to equal its former traffic.

The traffic statistics show some interesting changes, although it is to be remembered that the increases are not due altogether to a growth of traffic, the mileage, on which the 1896 results are based, being about 10 per cent. greater than in 1895. The number of passengers carried was 4,139,473, an increase of 20.7 per cent., but the average distance traveled per passenger was greater, so that the increase in passenger miles was 40.5 per cent., the total being 250,205,340 passenger-miles. The rate per passenger per mile was 2.113 cents in 1896, showing a decrease of 12.14 per cent. The passenger train earnings were \$1,458 per mile of road, and \$1.01 per train-mile. There were 38 passengers in each train, or 20 per cent. more than in 1895, and 11.39 passengers in each car, or 18 per cent. more than last year.

The freight statistics do not show as good increases in freight carried or in the economy of movement, though this is largely because company freight is not included in the figures this year, and was so included in 1895. With this traffic, which was very heavy in 1896, omitted, the tons carried show an increase of 18.9 per cent., the total having been 7,941,980. Ton mileage increased only 12.8 per cent., the average haul having fallen to 156 miles from the 164.6 miles reported in 1895. The rate per ton per mile was 9.72 mills as against 9.84 mills received in 1895.

Freight earnings per mile of road were \$2,635 in 1896 and \$2,612 in 1895; per train-mile they were \$1,404 this year and \$1,445 last year. The average train load was 144 tons in 1896, and 146 tons in 1895, though, as already stated, the latter item includes company freight. This train load is, of course, very low. The Southern has many miles of lines of very thin traffic, and the report gives no data for averaging the more important lines separately. The coal tonnage was over 2,235,000, and the mineral traffic altogether was 2,957,000 tons, or 38 per cent. of the total freight shipped. Lumber accounted for 813,000 tons additional, or 9.8 per cent., these two classes amounting to 48 per cent. of the total of about 7,335,000 tons carried.

The question of new equipment and maintenance improvements brings up the matter of chief interest in the report. This is the progress which has been made in uniting into a compact organization the loosely held lines of the old Richmond Terminal Company. Within two years, under very able management, the straggling roads of the old system have been brought together, formed into strong lines, almost altogether rebuilt, the old equipment replaced with modern engines and cars, so that now the road is prepared to carry its traffic and develop new business, under the conditions of the present day, and earn a fair return to its security holders. During the year the expenditures charged to capital account were \$758,842. This included \$447,000, roughly, for real estate for shops and stations and \$258,000 for new shops at Atlanta, Knoxville, Alexandria, Va., and Salisbury, N. C. The expenditures for new equipment were \$1,059,895, of which \$946,000 was charged to capital. The new equipment thus bought consisted of 32 locomotives, 37 passenger cars, 894 freight cars, 4 barges and a steam tug. The sum named also included the cost of equipping 35 locomotives and 1,537 freight cars with air brakes, and 2,513 cars with automatic couplers.

The equipment on hand June 30, 1894, and June 30 1895, is shown below:

	1896.	1894.
Locomotives.....	638	629
Freight cars.....	19,457	18,305
Passenger cars.....	584	487
Road equipment.....	275	329

In the two years 39 locomotives, 16 passenger and 915 freight cars have been destroyed or sold. The new equipment purchased or built has been 43 locomotives, 45 passenger cars and 2,030 freight cars.

Operating expenses were divided as follows:

	1896.	1895.
Maintenance of way and structures... equipment.....	\$3,398,699	\$2,978,245
Conducting transportation.....	2,093,585	1,794,192
General expenses.....	6,798,083	6,164,292
	1,170,681	1,125,825

President Spencer points out that in addition to the 41,000 tons of new steel rail purchased during 1895, 14,000 tons were purchased during the fiscal year just ended. Of the 55,000 tons purchased in the two years, 17,099 tons are of 80 lbs. and 37,901 tons of 75 lbs. weight per yard. During 1896 26,159 tons were laid, and 20,719 tons during the previous year, leaving 8,122 tons on hand July 1, 1896, all of which will have been placed in the track before Oct. 1. In addition to the expenditures for new construction and improvements and for new equipment, above referred to as charged to capital account, marked improvements have been made during the year in the physical condition of the road and equipment, the cost of which has properly been charged to operating expenses. Among such items the following may be mentioned:

There are 79 miles more of 80-lb. steel rail, 130 miles more of 75-lb. steel rail and 126 miles less of iron rail in the main tracks than at the close of the fiscal year ended June 30, 1895; 3,660 lin. ft. of wooden bridges and trestles have been renewed with steel structures, 151 miles of additional stone and gravel ballast have been placed in track, 2,232 lin. ft. of trestles have been filled with earth or stone.

The principal lines of the system are in such physical condition that immediate and considerable reductions can safely be made in expenses for maintenance, to meet the present depression in business. With the completion

of the Salisbury shops, no new construction work of any importance will be in progress, and none will be undertaken under existing conditions of trade.

Denver & Rio Grande.—The report for the year to June 30 makes favorable comparisons with the operations of 1895, which had shown a great improvement over the results of 1894. Earnings and traffic, however, have still a good deal to gain before they reach the figures reported prior to 1893-4, when the company's business was so disastrously affected. In the year to June 30, 1894, gross earnings from traffic fell off \$2,841,000, roughly, or 30.5 per cent., and net earnings were \$1,532,000 less, or 37.9 per cent. below those of 1893. In 1895 the increase in gross earnings from traffic was 6.8 per cent., and in net earnings was 16.8 per cent. This year's gross earnings are still more than 1½ million dollars less than the gross earnings of 1893, and the net earnings are about \$833,000 less.

The summary of results, for the last two years, and for 1893, is appended:

	1896.	1895.	1893.
Gross earn.....	\$7,551,186	\$6,916,840	\$9,317,646
Oper. exp.....	4,348,780	3,991,212	5,282,085
Net earn.....	\$3,202,406	\$2,925,628	\$4,035,561
Total net income.....	3,259,741	2,940,228	4,090,136
Fixed charges.....	2,424,782	2,411,538	2,687,828
Surplus.....	\$834,959	\$528,690	\$1,402,308

The company paid two per cent. on its preferred stock in 1893, and in spite of the tremendous falling off in income in the following year, met its fixed charges with a small surplus over; in 1895 it reported a surplus of \$528,690 to June 30, and resumed dividends in the latter part of 1895, and in the year to June 30, 1896, paid two per cent. on the preferred stock, calling for \$473,000. The surplus to profit and loss, June 30, 1896, was \$218,392.

These figures show great recuperative powers, and indicate the substantial soundness of the industries of Colorado.

A table giving the tonnage of different classes of freight and the revenue derived gives an opportunity for interesting comparisons. As there has been previous occasion to point out, since the collapse of the silver mining industries in Colorado, the tonnage from precious ores does not provide, by any means, the largest proportion of the company's tonnage. It is, however, a paying traffic. In 1893 it provided 18.7 per cent. of the total tonnage, but gave the company 22.8 per cent. of its total freight revenue. Next to this in amount of revenue derived in 1893 was merchandise traffic, forming 22.6 per cent. of freight earnings, although but 7.2 per cent. of tonnage. In 1896 the proportion of precious ore carried out declined to 12 per cent. of the total freight traffic, giving the company 20 per cent. of its freight revenue. Merchandise traffic gave almost the same proportion of freight as in 1893 and 30.9 per cent. of the freight revenue. Coal in 1896 gave 33.4 per cent. of the traffic and 15.9 per cent. of the revenue. This compares with 43.4 per cent. of the tonnage in 1893, when the revenue from coal traffic was 20.4 per cent. of the freight revenue. The tonnage has been reduced from 828,000 tons, roughly, in 1893 to 659,000 tons in 1896.

A significant feature of the traffic in 1896 is the increase in passenger traffic and earnings. Passenger earnings were \$1,478,911, about \$295,000 larger than in 1895; in 1893 they were \$1,782,000. The increased earnings from this source, indicating a better ability to pay for traveling, is a most healthful indication of growing prosperity. Revenue passenger train miles were 1,739,656, 18 per cent. more than in 1895. The statistics of car miles show an increase of 21 per cent. in mileage run by day coaches; of 22 per cent. by tourist cars, and of 35 per cent. by sleeping cars.

In freight traffic the increase in revenue in 1896 was \$359,114, and \$649,887 in two years. The freight train mileage was 2,499,839 against 2,950,260 in 1893, the increase over 1895 being two per cent.

Operating expenses were 57.5 per cent. of the earnings in 1896; 57.7 in 1895 and 56.6 in 1893, a very low ratio, but the equipment is reported to be in good condition and adequate for the traffic, and the physical condition has not been neglected. The details of operating expenses show that over \$157,000 more was spent in maintenance of roadbed in 1896 than in 1893. The details for three years of three items are:

	1896.	1895.	1893.
Maint. of way and structures.....	\$1,163,384	\$954,857	\$1,046,823
Maintenance of equipment.....	423,755	398,310	611,379
Conducting transportation.....	2,302,145	2,188,763	3,209,426

Some results per mile of road are given below for six years:

	1896.	1895.	1894.	1893.	1892.	1891.
Gross earn.....	\$1,540	\$1,174	\$3,915	\$5,661	\$5,385	\$5,605
Net earn.....	1,925	1,763	1,513	2,452	2,262	2,115

During the year 9,255 tons of steel rails were purchased and charged to operating expenses, and of this amount 6,715 tons was put down during the year and the balance, 2,540, is now being laid in track. The rails purchased include 5,266 tons of the latest pattern of rail adopted by the company, weighing 85 lbs. to the yard. The officers deemed it prudent to increase the weight of rails from 75 lbs. to 80 lbs. per yard on those portions of the standard gage main line where the traffic of the system is concentrated and the passenger trains have the highest speed. The heaviest rails used last year were laid north of Pueblo, and the balance of 92 miles of single main track, between Denver and Pueblo, will be relaid with 85-lb. rails, in the near future as earnings permit. Upon the standard gage main line between Denver and Grand Junction,

455 miles, and the Trinidad branch, 91 miles, 65-lb. rails are the lightest rail sections carrying standard-gage equipment. The report contains an interesting diagram, showing the increase in weight of rail used from 1871, when the heaviest section used was 31 lbs. to the yard, to 1896.

Important additions to the freight-car equipment were made during the year, including 750 box cars of 30 tons capacity purchased, and 33 constructed in the company's shops. It is believed that no new freight cars will be needed for two or three years. The cost of these cars was \$387,867, of which \$225,000 was provided from the special renewal fund, \$19,299 from equipment renewal fund and the balance, \$143,567, from income. No increase in the value of the equipment account, as carried on the books of the company, was made on account of this new equipment. The company now owns 3,232 standard gage freight cars of 30 tons capacity, which is stated to be considerably in excess of the average carrying capacity of freight cars owned by other Western lines. President Jeffery gives the average capacity per car of over 100,000 freight cars belonging to six large Western lines, as about 20 tons and the 3,232 standard gage cars belonging to the Denver & Rio Grande have an aggregate carrying capacity equal to 4,800 of the average freight cars belonging to the other lines referred to.

During the year the company has purchased the Santa Fe Southern, extending to Santa Fe, New Mexico, and owns the entire share capital of \$375,000. This road was acquired with little outlay of cash, the first mortgage bonds of the Rio Grande Southern held in the treasury being accepted in payment for the road. These bonds were valued at \$177,450, and on their withdrawal the stock of the Rio Grande & Santa Fe, under which the Santa Fe Southern was reorganized, was substituted, as a treasury asset. The reorganization of the Rio Grande Southern was completed during the year, and the Denver & Rio Grande has become the owner of the majority of the stock. The operations of the road are not included in the Denver & Rio Grande report, but it is stated that by careful management the road has earned its fixed charges and a small fund for contingencies.

Chesapeake & Ohio.—The report of the Chesapeake & Ohio to June 30 has the same peculiarities that we have been familiar with now for some years, viz., very low rates, very heavy and increasing trainloads, a growing traffic, close and skillful management, liberal expenditures for betterment charged to working expenses, constant improvement of the property, with small increase of capitalization and increasing earnings, notwithstanding the adverse conditions. In brief the chief results of working have been as below:

	1893.	1894.	1895.	1896.
Miles operated.....	1192.5*	1278.1*	7125.9*	1275.9*
Gross earnings.....	\$10,336,810	\$9,044,108	\$9,596,031	\$10,221,131
Operating expenses and taxes.....	7,132,761	6,027,128	6,464,528	6,963,153
Net.....	\$3,204,050	\$3,016,981	\$3,131,503	\$3,257,979
Interest, etc.....	2,750,290	3,002,920	3,112,797	3,116,638
Surplus.....	\$423,760	\$14,060	\$18,706	\$147,341

* Also 31.5 miles between Orange and Washington, operated under trackage agreement.

The earnings from passengers were \$1,949,790, about \$100,000 more than last year, but less than in any other one year since 1891. The rate per passenger mile was 1.952 cents, or .028 cent less than in 1895; but the passenger miles were 6,600,000 more, viz., 99,864,173. The increase in movement a little more than offset the fall in the rate. But the passenger income, including mail and express, is only about 22½ per cent. of the total.

The freight earnings were \$7,810,298, the largest in the history of the road. These were half a million more than in 1895, \$1,181,000 more than in 1894 and a quarter of a million more than in 1893. Yet the rate per ton-mile was only 0.426 cent in 1896; 0.425 in 1895; 0.478 in 1894; 0.511 in 1893; 0.518 in 1892; 0.525 in 1891, and 0.535 in 1890. The ton-miles in 1896 were 1,836,024,472, and in 1895 1,720,788,501.

Coal is much the largest item of freight, viz., 45.55 per cent. of the total tonnage. Coke is the next largest item, 6.87 per cent. These items pulled down the average rate; but even without them it was very low. On all freight other than coal the ton-mile rate was only 0.539 cent. That is, the local traffic is relatively very small. Fortunately the low grades and the splendid condition of road and equipment permit extraordinary loads; and the signaling, the discipline, the arrangement of yards and sidings and cheap fuel, all unite to make it possible to work the road with few accidents and at low cost.

This year the average trainload reached the very extraordinary figure of 325 tons; last year it was 315 tons. In 1890 it was 225 tons and it has steadily risen year by year ever since until it is we suppose considerably the heaviest to be found on any railroad doing a general business, and perhaps it is now heavier than the loads of any of the short roads doing only a coal and mineral business.

It would be interesting to follow out this report further, noting in detail the changes in cost of transportation and the recent improvements in the property. We shall only stop now, however, to call attention to the fact that the company has now in main track 40 miles of 100-lb. rail and 561½ miles of 75-lb. In the year under review 10,000 tons of new rail was laid, the rails

having been bought for \$22 a ton; this, of course, under an old contract.

Wabash.—The result of the operations for the year to June 30 are briefly given in the statement of President Ashley, which forms the introductory portion of the annual report and was issued this week in advance of the full report. The general summary is as follows, compared with the previous year:

	1896.	1895.	Inc. or dec.
Gross earn.....	\$12,807,146	\$11,959,843	I. \$847,303
Oper exp. (72.16 p. c.)....	242,604	8,921,029	I. 321,575
Net earn.....	\$3,564,537	\$3,038,809	I. \$525,728
Other receipts.....	140,739	130,394	I. 10,345
	\$3,705,277	\$3,169,203	I. \$535,074
Deduct balance, joint track rentals, and miscellaneous.....	417,254	366,046	I. 51,478
Net receipts.....	\$3,288,023	\$2,803,429	I. \$484,594
Taxes.....	519,678	507,793	I. 11,885
Interest.....	2,701,545	2,838,541	D. 136,996
Surplus.....	\$66,799	def. \$547,906	I. \$614,705

Out of this surplus was paid a dividend of one per cent. on debenture A bonds, leaving the net surplus, \$31,799.

The recovery from the depression of the two previous years was thus sufficient to meet the year's fixed charges and leave a small surplus. The gross earnings in 1894 and 1895 were much lower than in any year since the last reorganization, and the \$12,807,000 gross earned in 1896 is still much below the earnings of other years. In 1893 and 1892 gross earnings were over 14 millions, and only fell below 13½ millions in 1889, the first year of the present company's existence. The net earnings make a more favorable comparison, and were exceeded only in 1890, when they were \$3,679,000 roughly. It is worth noting that in these two years the ratio of operating expenses to earnings was about the same, 72.44 per cent. in the earlier year, and 72.16 per cent. in 1896. Last year expenses were 74.59 per cent. of earnings, which was a considerable decrease over the ratio reported in 1894, when they absorbed 78.32 per cent. of earnings.

During the year the refunding of the \$9,000,000 first mortgage bonds, referred to in the last annual report, has been successfully accomplished, and the financial status of the company is now more in accordance with the conservative spirit of the times.

The Wabash is a member of the Joint Traffic Association, and President Ashley devotes a paragraph to that organization, which, he believes, has demonstrated to the satisfaction of all companies interested the entire practicability of maintaining established rates.

Judge Simonton has dissolved the temporary injunction against reduction of rates by the Seaboard Air Line, holding that the Court has no jurisdiction; but thus far the road has made no formal announcement of any reduction from the regular rates (which were re-established when the injunction was issued). The war in rates between Baltimore and Norfolk and Richmond, affecting only water transportation, continues about the same as it was a week ago. Free staterooms and even free meals are threatened but we do not learn that these methods of drawing custom have been actually put in effect. The passenger traffic on the boats is said to be very heavy. Judge Simonton's decision, as reported by telegraph, holds that the court has no jurisdiction, because all parties necessary to the case were not present in court. The decision says that as the Raleigh & Gaston and Seaboard & Roanoke had leased the Georgia, Carolina & Northern, and operate it independent of the control of the lessor, they must be present in court, as they are the parties at fault, and action without their presence would be an unwarranted interference of the court with the terms of the lease.

"If this case were to proceed, and it should be held that injunction should issue, the Georgia, Carolina & Northern would be restrained from carrying goods at the rates fixed by the Seaboard & Roanoke and Raleigh & Gaston, its lessees. The order of injunction would abrogate this part of the contract, and to this extent would deprive the lessees of the property in lease. Could the court abrogate the lease on grounds like these without hearing the lessees as parties in the case? Could the court investigate the conduct of these two lessee corporations and convict them of the charges in their absence? Are not the interests of the Georgia, Carolina & Northern and the two lessee roads inseparable? If so, their absence interposes an obstacle in the way of the decree that is insuperable. . . . Seaboard Air Line is only the designation of a line operated and controlled by two corporations, the Raleigh & Gaston and the Seaboard & Roanoke, one a corporation of the state of North Carolina and the other of the state of Virginia."

The assorting of mail in street cars on city railroads in numerous cities seems to have been found so satisfactory that the principle is to be extended by the employment of the same arrangement on lines where tracks and cars are not available; that is, on common roads and streets, by the use of wagons. Mr. Neilson has ordered two large wagons, to be used experimentally, one probably in New York City and the other in Washington. The wagons are covered, 12 ft. long, 5 ft. wide and 6½ ft. high inside. It further appears, in a press dispatch from Philadelphia, that the adaptation of the railroad postal car, or rather of the idea of sorting mail while it is on the road, to local routes in cities, is to be still further developed by a radical extension of the electric street railroad service in Philadelphia. The Union Traction Co., operating nearly or quite all the important street lines in that city, has ordered 14 additional mail cars, and it is the intention of Mr. Neilson to carry out, to the

utmost extent, the principle of having every letter take the shortest and quickest route from the street box, where it is collected, to the post-office at its destination. To this end practically all of the carriers will deliver collected letters into the cars and not into the post-office, and the clerks in the cars will, where time can be saved, send letters directly to railroad stations, making them up in packages for the trains. The city mail cars will also exchange pouches at passing points and junctions, so that a large proportion of the city mail will be expedited one or two hours. All of this is, of course, in accordance with simple common sense and the public will be quick to appreciate the improvement. The only objection that we can think of will be that of the politicians who thrive on "appropriations" and the business of securing them. On what pretext can a Congressman ask for \$200,000 for a public building, in the city of his home, if the postmaster does nearly all his work in the street?

The West Coast Flyer between London and Aberdeen is now scheduled for a portion of its trip, to wit, from Perth to Forfar, 32½ miles, in 32 minutes; that is, at the rate of 60.9 miles an hour, said to be by far the fastest time ever seen in Bradshaw's Guide. (It is faster than any schedules that are known of in this country.) Mr. Rous-Marten, whose principal business seems to be riding on fast trains, has published in the *Engineer* his notes of two rides on this train. The weight of the cars, in each case, was 161 tons, about the same as that of the cars in the Empire State Express. From London to Carlisle, that is, over the rails of the London & North Western, the task of the locomotives was so easy that the account is chiefly made up with the difficulty the engineers had in restraining their steeds; but as soon as the Caledonian line was reached the schedule was changed to 56.8 miles an hour, and the real stress of the journey began. The first Caledonian engine was one of the "Dunalastair class" (four driving wheels, 6 ft. 6 in. in diameter; cylinders 18½ in. x 26 in.; heating surface 1408.23 sq. ft.; weight on drivers 31 tons). The first stretch of 117½ miles was traversed in 116 min. 53 sec. A long ascending grade of 70.4 ft. per mile was traversed at 36 miles an hour. The 33-mile stretch from Stirling to Perth, including a five-mile ascending grade, was made in 34½ min., and this grade, varying from 59 ft. per mile to 68 ft., was traversed in a trifle over six minutes.

Surely we, as a people, can never be accused of want of hospitality. The captious may sometimes criticize the quality of our hospitality, but its quantity is not to be questioned. The Manitou & Pike's Peak rack railroad has just given a brilliant illustration of this. As all the world knows (thanks to the activity of Mr. Baraton) Mr. Frederick Harrison, General Manager, and Mr. Robert Turnbull, Superintendent of the line of the London & North Western, are now traveling through the United States, seeing what they can see of the wonders of our land, and especially of our railroads. Last Sunday they were coming down Pike's Peak on the rack railroad. Inasmuch as the managers could not produce a butting collision to order, they entertained their guests with a runaway. The engine broke a connecting rod, according to the newspaper accounts, and knocked out a cylinder head also. The engine could not be controlled and the engineman and fireman jumped off. The engine ran down the grade nearly a mile, jumped the track, and finally landed in a ravine 100 ft. deep. The car, however, was not attached to the engine and was got under control and the lives of the passengers saved. We assure Mr. Harrison and Mr. Turnbull that this is not characteristic American railroading, and, to tell the truth, we never before heard of a serious accident on the Manitou and Pike's Peak. The performance was merely a spectacular incident.

TRADE CATALOGUES.

Preservation of Timber.—The American Wood Preserving Co., of Philadelphia, Pa., has just issued a handsome little pamphlet on "Woodline and the Preservation of Timber by the Wood Creosote Process." This method of treating timber was described in our issue of Jan. 24, 1896. The pamphlet gives at length the history and details of the process of using "Woodline," some opinions of the technical press, a report of experiments made in treating crossties and a statement of uses to which the preservative can be put. A number of cuts, reproduced from photographs, illustrate bridges and sections of railroad tracks, the ties of which have been treated as described in the catalogue. On the line of the trolley electric road between Mt. Holly and Burlington, N. J., the line poles were treated with "Woodline." The method of treating timber employed by the Pennsylvania road at Pavonia, N. J., is also illustrated. Ten different railroads are mentioned as using "Woodline," among them the Pennsylvania, the Atchison, Topeka & Santa Fe, and the Cincinnati, New Orleans & Texas Pacific, the last named having recently ordered 800 gallons for use on the new bridge over the Cumberland River at Burnside, Ky.

TECHNICAL.

Manufacturing and Business.

The Middletown Car Works, which went into the hands of a receiver in July, have been appraised by H. Handshaw and John Woods, and the report of appraisal was filed on Aug. 21. Stock, lumber, iron and car material is appraised at \$17,635, while the plant, build-

ing and machinery are valued at \$60,000, making a total value of the works, property and contents \$77,635.

A charter has been granted to the Seaman Sleeth Co., of Pittsburgh, Pa., which has been incorporated, with a capital of \$600,000. This new company has succeeded the old firm of Seaman, Sleeth & Black, proprietors of the Phoenix Roll Works, in Pittsburgh. The officers of the new concern are: Jos. F. Seaman, President; Robert Sleeth, Vice-President, and Jas. L. Morrow, Treasurer.

The Johnston Railroad Frog & Switch Company, of Chester, Pa., reports that it is operating its factory on night and day turns. The order for the frog, switches and crossings for the temporary tracks for the Reading subway in Philadelphia is a very large one, and will alone keep the company busy for a long time, but in addition it has plenty of other orders. The company is enlarging its shops, putting in new planers, drills, boilers and engines.

The real estate, machinery and other property of the Harrisburg Car Manufacturing Co. will be offered for sale at the Court House at Harrisburg, Pa., on Sept. 22. About 500,000 ft. of lumber of various lengths and sizes, and certain car trusts and mortgage bonds of the Iron Car Equipment Co. and other securities will be offered for sale at the same time.

The Boston & Lockport Block Company has recently received from the officers of the World's Columbian Exposition the diploma and medal awarded to the company for its exhibit of wood and steel blocks for railroad use at Chicago in 1893.

The Laidlaw Dunn-Gordon Co., of Cincinnati, has had painted on the roof of its factory (which is 665 ft. long and close to the C., H. & D. R. R.) in large gold letters, 13 ft. high, "McKinley, Hobart and Protection," and on the other roof "McKinley, Hobart and Sound Money," which shows which side they are on.

The New York Rail Insulation & Equipment Co. has been formed to manufacture the Wilson system of track insulation, which was described in our issue of Jan. 21, 1896. The office of the company is at 200 Market street, Newark, N. J.

Iron and Steel.

The plant of the Illinois Steel Co., at Hammond, Ind., has been shut down for an indefinite period. Since the signing of the new scale, in January, the mill has been running steadily, and the present closing will throw 300 men out of employment.

Furnace A of the Edgar Thomson group, at Bessemer, Pa., has been blown out for repairs and will be rebuilt. Furnace D, which has recently been blown in, has been extensively overhauled.

At a meeting, held at Cresson, Pa., on Aug. 28, of the Bessemer Billet Association, the manufacturers of open-hearth steel, who are connected with the association, formed a subsidiary pool, with the object that the production and sale of all the open-hearth steel for the American market be controlled in the same manner as the sale and production of Bessemer billets. In taking this action the steel producers who have been selling cheap open-hearth steel have made the Bessemer pool much more effective to maintain prices. The price of open-hearth blooms and billets was fixed at \$22.50 per ton delivered, which is \$2 per ton more than the pool price of Bessemer billets, and just about that much higher than open-hearth steel has been selling lately.

At the works of the Pennsylvania Steel Co., at Steelton, Pa., the molten cast iron from the blast furnaces is now conveyed directly to the open-hearth furnaces. This plan has been under foot for the last three years, but was put into operation only a few days ago. Ladle cars are used for transferring the metal, which is charged from them directly into the open hearth furnaces. This is the first use of the so-called "hot metal route" in that vicinity.

No. 2 furnace of the Pennsylvania Steel Co. is to be blown out in a few days, and relined. It is the largest at the works and has been in operation nearly 20 months. Its maximum capacity is more than 200 tons a day.

New Stations and Shops.

Plans are being prepared for improvements at the Buffalo, Rochester & Pittsburgh Railroad station, at Rochester, N. Y., on West avenue. It is intended to tear down the building to the west of the station proper and to erect another on its site to contain all the company's offices. The plans are being drawn up by Chief Engineer Hoyt.

The Canadian Pacific will erect a new station at Woodstock, Ont., plans for which are in course of preparation. Work will probably be commenced this fall.

Electrical Transmission of Power.

The power of the Kern River, the third largest stream in California, is about to be utilized, the work undertaken by the Power Development Company being nearly completed. The power-house is on the north side of the river, at the mouth of the canyon, almost 14 miles north-east of Bakersfield. Here the stream forms a number of cataracts and rapids previous to taking a course through the valley. The point of diversion of the necessary flow for the power is some 9,000 ft. up the canyon, where the flume begins. This flume is 8 ft. wide and 6 ft. deep, and is covered. A railroad track is laid upon the cover for the full length of the flume, 8,000 ft. There are no sharp angles, the changes in the course being made by curves and tangents. The grade of the flume is 5.8 ft. to the mile and 475,000 ft. of red wood was used in its

construction. The flow is calculated at 280 cu. ft. per second. At its terminus at the mouth of the canyon 8,574.9 ft. from the point where it leaves the river, it is 203 ft. above the power-house. Here the water enters a steel pipe 540 ft. long and 5 ft. 6 in. in diameter. The fall from the end of the flume to the power-house is 201.9 ft., and the capacity of the water is estimated at 7,500 H. P. The contract for the electrical equipment has been awarded to the General Electric Company, whose three-phase apparatus will be used to transmit the power of the river to Bakersfield. This will consist at first of two 450 Kilowatt G. E. three-phase generators running at 257 revolutions per minute with a voltage at the dynamo terminals of 550 volts. This will be raised in step up transformers to 11,000 volts and will be carried on six No. 4 bare copper wires to the sub-station at Bakersfield, where it will be transformed down to 2,000 volts for distribution. The current will be utilized to operate a system of electric railroads connecting Bakersfield with Kern and other districts. It will also be applied to street and house lighting, as well as to the operation of pumps for irrigation purposes. The work is being pushed to completion as rapidly as possible, and it is expected that by Nov. 1, the current will be turned into the transmission wires.

Underground Electric Haulage at Cleveland Lake Mine.

At the annual meeting of the Lake Superior Mining Institute, held at Ishpeming, Mich., on Aug. 18, a paper was read by Mr. J. E. Jopling, on the electric haulage plant of the Cleveland Lake Mine, at Ishpeming. The plant was installed during the years 1893-94, the great lateral extent of the ore body having made necessary some system of mechanical haulage. The electrical equipment was installed by the General Electric Co. The generating machinery is located in the engine-house, and consists of a direct current machine of the multipolar type; it makes 650 revolutions; gives an electro-motive force of 220 volts without load and has a capacity of 420 amperes. Two main wires, No. 0, copper, take the current down the shaft, one wire for each level, and are insulated with rubber inside of lead pipe, which is covered with asphalt paint. In the levels the wires are held by the usual mining insulators, at a height of 6 ft. 6 in. above the rails.

The haulage plant on the first level consists of a 65-H. P. motor machine on four 24-in. wheels, and 20 iron tramcars. On the second level the motor is smaller and of higher speed; it is 30 H. P., on four 30-in. wheels; the cars are of iron, stiffened with wood. With this plant, the cost of tramming ore, including the proportion of engine-house expenses and maintenance, and the wages paid to motormen and chute men, has been as follows: In 1894, 3½¢ per ton; in 1895, 4½¢ per ton; in 1896, to August 1, 4½¢ per ton.

Record of the United States Cruiser Brooklyn.

A trial of speed of the new cruiser Brooklyn was made at Boston on August 27. The Brooklyn covered a distance of 83 knots in a continuous run at an average speed of 21.92 knots per hour, indicating that she is the fastest vessel of her class in the world. During part of the run an average speed of 22.9 knots was maintained for a distance of about seven knots. In her run of 83 knots the boiler pressure was kept at 160 lbs. The course was marked by seven buoys, and the following table shows the time and the speed between the buoys:

Buoy.	Out trip.		Return trip.	
	Elapsed time. Sec.	Speed. Knots.	Elapsed time. Sec.	Speed. Knots.
1.....	18:25½	22.48	19:04½	21.70
2.....	18:56¼	21.87	18:50	21.98
3.....	18:21	22.90	19:48¾	20.90
4.....	19:27¼	21.28	18:49	22.29
5.....	18:37¼	22.26	19:18	21.45
7.....	18:44½	22.05	18:51¼	21.96

Compressed Air Motors on the Elevated Road.

The Manhattan Railway has given the American Air Power Co. permission to make a trial of one of its locomotives on the Sixth Avenue line. The motor to be used is designed to draw a regular train of five cars at the present scheduled speed, and to do the work of the engines now on the road. The trial runs will be made from Rector street north on the main line and return. Property has been leased at Greenwich and Rector streets by the Power Co. for a year, and there the plant to supply the compressed air will be installed.

Third Rail Electrical Contact.

Electric operation of the Nantasket Beach branch was, in June last, extended as far as East Weymouth in the direction of Boston on the main line of the Old Colony. On the new line, however, the overhead conductor is not used. A third rail laid between the rails of the surface track takes the place of the trolley wire, and although this is the first instance of a third rail electrical conductor being laid between the tracks of a steam road, and some measure of failure might consequently be looked for, the cars have been run regularly over it between the regular steam trains without hitch or difficulty. In the operation of the cars the change from the overhead trolley to the third rail source of power is made imperceptibly. When the car approaches the end of the trolley wire a knife switch under the head of the hood of the car is closed connecting the shoe beneath

the car with the motor circuit; the trolley slides off the overhead wire and is hooked down, the car meanwhile continuing on its journey. On the day of the inauguration of the third-rail section, several high-speed spurts were made, and these have frequently been exceeded in the actual service.

Rail Joints.

In our abstract of the report and discussion on Rail Joints at the convention of the New England Roadmasters' Association, we failed to mention the most important action taken. The committee was continued and instructed to look further into the merits of various devices and to report at the next annual meeting. Meantime, it was recommended that the Association try 100 each of approved joints in direct comparison with new angle bars, the trials to be made on stone and on gravel ballast.

One Pound of Coal on a Steamship.

The value of one pound of coal at different epochs of steamship evolution, as given by Mr. A. J. McGinnis, President of the Liverpool Engineering Society, has been as follows: In 1810, a pound of coal propelled a displacement weight of .578 ton 8 knots; but the earning weight was only one-tenth of this, 90 per cent. of the displacement representing the hull, machinery and fuel. In 1850, with iron vessels and the screw propeller, a displacement weight of .6 ton was propelled 9 knots by a pound of coal; but the proportion of cargo had risen to 27 per cent., or .16 ton. In 1860, with higher boiler pressure and the surface condenser, .82 ton displacement was propelled 10 knots, and the cargo was 33 per cent., or .27 ton. In 1870, after the compound engine had come into use, 1.8 tons displacement was propelled 10 knots, and here the cargo formed 50 per cent. of the whole, being .9 ton. In 1885, there were two classes of freight boats: the "tramp" propelled 3.4 tons displacement 8½ knots, with 60 per cent., or two tons of cargo; at the same time the enormous cargo steamers of the North Atlantic were driving a displacement of 3.14 tons 12 knots, with 55 per cent., or 1.7 tons of cargo. On the modern express passenger steamers, the cargo weight is down to .09 ton per pound of coal.

Pneumatic Tires.

In the June *Bulletin* of the Society of Civil Engineers of France, M. A. J. Michelin gives an exhaustive account of some tests made to determine the efficiency of pneumatic tires in contributing to the ease and comfort of a vehicle. With the usual French thoroughness he describes the earliest pneumatic tires, and reprints descriptions of them published in 1846. His own experiments were made with the pneumatic tire and the ordinary wheel, and there were five series in all. The first was made on three days, when the ground was covered with 2 in. of snow, when the same was melting and when the ground was muddy. The results obtained showed that with the empty carriage moving at a walk through the snow the draft was 35.9 lbs. with the iron wheel, and but 25.2 lbs. with the pneumatic tire. At a trot, with a load of 660 lbs., the pull was 68.6 lbs. and 39.5 lbs. respectively. In the mud, under the same conditions of load and speed, the pulls were 35.2 and 50.7 lbs. for the iron wheel, and 23.1 and 31.2 lbs. for the pneumatic tire. The other tests consisted of pulls of varying speeds over macadam, paved and ordinary roads, and in every instance the pneumatic tire showed a saving in pulling power of from 30 to nearly 50 per cent. As to comfort, the well-known silence of the pneumatic tire is enlarged upon; also careful measurements were made to show the difference in the vibrations caused by the two types of tires, and in this the advantages of the pneumatic tire were clearly shown. Its springy action is demonstrated by the fact that when it is made to pass over three obstacles there is a wavy motion given to the diagram, and that if two of the three are removed the same wavy effect remains. Hence the elasticity of the pneumatic tire is proven by the rhythmic vibrations that it produces. But the main feature of interest in the matter lies in the fact that the actual amount of power required to pull a carriage equipped with pneumatic tires is very much less than it is when ordinary wheels are used.

Prices of M. C. B. Freight Car Couplers and Coupler Parts.

The following list of prices of couplers and parts is published by the Secretary of the Master Car Builders' Association:

Buckeye Coupler: The Buckeye Malleable Iron & Coupler Co., Columbus, O. The current market prices are as follows: "Little Giant" Buckeye Coupler, complete, \$9; Coupler Head, \$6; Knuckle, \$2.50; Locking Link, 50c.; Pivot Pin, 25c.; f. o. b. Columbus, O.

Chicago Coupler: Latrobe Steel Co., works, Melrose Park, Illinois; Old Colony Building, Chicago, Ill. Interchange prices are as follows: Coupler, complete, \$11; Drawbar, only, \$7.50; Knuckle, only, \$3.50; Pivot Pin, only, 30c.; Locking Arm, only, 30c.; Lifting Pin, only, 10c.; Knuckle Opening Spring, only, 5c.; f. o. b. Chicago.

Drexel Coupler: The Drexel Railway Supply Co., Rookery Building, Chicago, Ill. The prices for parts of coupler for repairs are as follows: Coupler Head, \$5.50; Knuckle, \$4.00; Lock, 65c.; Fulcrum Pin, 25c.; Clevis, 10c.

Gould Coupler: Gould Coupler Co., 66 Broadway, New York City. Gould Coupler complete, \$12.50; Head or Shank, \$8.35; Knuckle, \$2.80; Knuckle Lock, 50c.; Knuckle Pin, 50c.; Chain for Lock, 25c.; f. o. b. Depew, N. Y.

Hinson Coupler: The Hinson Mfg. Co., Gaff Building, Chicago, Ill. The prices for the coupler and parts thereof are as follows: Drawbar complete, including Hangers, \$10.00; Drawbar complete, except steel parts, \$7.00; Drawbar Head, without any other parts, \$6.00; Knuckle, \$3.50; Lock, 40c.; Knuckle Pin, 25c.; No. 4 A.C. Hanger, 15c.; No. 5 Hanger, 20c.; f. o. b. Chicago, Ill.

Jannet Coupler: The McConway & Torley Co., Pittsburgh, Pa. Coupler complete, \$10; coupler casting, \$6.25; W. I. Knuckle, \$5.25; Locking Pin fitted with Clevis, 30c.; Knuckle Pin, 25c.; f. o. b. Pittsburgh, Pa. Wrought iron and not cast steel is standard material for knuckles. Wrought-iron Knuckle, returned, remade for \$1; Broken Coupler Casting, returned, replaced for \$4.

Pooley Coupler: Pratt & Letchworth, Buffalo, N. Y. The price for coupler and coupler parts is as follows: Coupler complete, \$9; Barrel, \$6.50; Knuckle, \$2.50; Broken Coupler, returned to manufacturer, full weight of scrap, replaced for the scrap and \$1; Broken Knuckle returned to be replaced for the scrap and \$1; prices, f. o. b. Buffalo, N. Y.

S. H. & H. Coupler: Shickle, Harrison & Howard Iron Co., St. Louis, Mo. Coupler complete, \$10.00; Shank, \$6.50; Knuckle, \$3.50; Locking Block, 75c.; Knuckle Opener, 30c.; Knuckle Pin, 25c.

Standard Coupler: Standard Coupler Co., 26 Courtlandt street, New York. Coupler complete, \$12.50; Drawhead, \$7.25; Knuckle, \$4.25; Locking Pin, \$1.00; f. o. b. Bridgeport, Conn.

St. Louis Coupler: St. Louis Car Coupler Co., St. Louis, Mo. Coupler complete, \$10.25; Coupler Casting, without Knuckle, \$6.25; Knuckle, \$4.00; Locking Pin, 35c.; Knuckle Pin, 25c.; f. o. b. St. Louis, Mo.

Thurmond Coupler: Isaac G. Johnson & Co., Spuyten Duyvil, N. Y. City. Coupler complete, \$10.00; Drawhead, \$6.00; Knuckle, \$2.50; Pivot Pin, 25c.; Lock, 75c.; Clevis, 10c.

Tower Coupler: The National Malleable Castings Co., Chicago, Ill. Coupler, complete, \$10.00; Bar, Malleable Iron, \$6.00; Knuckle Steel, \$3.00; Lock, Malleable Iron, 65c.; Knuckle Pin, Steel, 25c.; Chain and Clevis, 25c.; f. o. b. Chicago, Ill.; Toledo, Ohio, or Cleveland, Ohio.

Trojan Coupler: The Trojan Car Coupler Co., Troy, N. Y. Coupler, complete, \$12.50; Drawhead, \$7.25; Knuckle, \$4.00; Knuckle Lock, 50c.; Knuckle Pin, 50c.; Operating Rod, 50c.; Finger, 25c.; f. o. b. Troy, N. Y.

Electrical Energy Direct from Coal.

At the annual meeting of the American Society for the Advancement of Science, held at Buffalo last month, an address was made by W. A. Noyes, Vice-President, Section C, on "The Achievements of Physical Chemistry." In the course of the address Mr. Noyes spoke as follows on the direct transformation of the chemical energy of coal into mechanical energy:

"Every one who is familiar with the extremely wasteful character of all processes now at our disposal for the transformation of chemical into mechanical energy must have had the thought that there is surely some means of saving a part of the enormous loss. At present the attention of the scientific world is turned toward the transformation of the chemical energy of coal into electrical energy as the probable solution of this problem. It seems to be almost certain that physical chemistry has already made clear the principles by means of which such a transformation may be accomplished. Dr. W. Borchers, by the use of a solution of cuprous chloride with producer gas, or carbon monoxide on one side and air on the other, has already obtained an electrical current which corresponds to a transformation of 30 per cent. of the chemical into electrical energy. This is an efficiency three times that of the best steam engines. There is no probability that this method can ever be practically useful, but that a practical method will soon be discovered is, at least, possible."

THE SCRAP HEAP.

Notes.

The Supreme Court of Arizona has upheld the constitutionality of the law inflicting the death penalty for train robbery.

The Citizens' Street Railroad Company, of Detroit, has abolished all three-cent fares, and the lowest rate on any of the company's lines at present is six tickets for 25 cents.

The Assistant Attorney-General for the Post Office Department has decided that "It is unlawful to send an ordinary letter by express or otherwise outside of the mails unless it be enclosed in a government stamped envelope. It is also unlawful to enclose a letter in an express package unless it pertains wholly to the contents of the package."

South American Notes.

The Peruvian Corporation has appointed Mr. Alfred Schatzmann, C. E., as Resident General Manager in Peru, with headquarters in Lima.

Germany seems to be reaping large advantages from the strained relations between Venezuela and Great Britain. A short time ago we noticed how much more favorable terms the Germans obtained in commuting the guarantee on their Caracas-Valencia ("Central") Railroad than the English were able to secure. Now we learn that a large Venezuelan loan for public works has been negotiated in Berlin, and in view of the growing relations between the two countries, Count von Rex, the German representative in Caracas, has been raised to the full rank of Minister Plenipotentiary and Envoy Extraordinary.

Japan has sent a commission to the west coast of South America to investigate trade conditions, with a view to ascertaining the desirability of establishing a steamship line from that country to the Pacific ports of Spanish America.

Senator Justo Chermont, of Pará, Brazil, has introduced a bill in the Senate for extending the river cable recently laid from Pará to Manáos, 1,000 miles up the Amazon, on to Tabatinga, the frontier town between Brazil and Peru, 1,000 miles farther west. The present cable had been in operation only 32 days when it parted. Five different breaks have been found. The current is said to be as much as 8 to 10 miles an hour in some places.

In spite of the talk about a Grand Central Station in Buenos Ayres, nothing definite has yet been done toward building one. Every scheme which has been proposed has fallen through, and still another one is brought forward by a hopeful firm of contractors. One apparent difficulty about this project is, as the Buenos Ayres *Herald* points out, that the residential section of the city is constantly and rapidly changing, and will continue to do so. The various schemes for a Central station, on the other hand, have contemplated its location in the vicinity of the docks. Elevated railroads, operated by electricity, connecting the business centers with the residence portions of the city, and with a new station on the site of the present so-called Central Station, is the plan suggested by the *Herald*.

A strike with a curious cause occurred on the Central Argentine Railway recently. An engine of a passenger train, driven by one Laws, collided with a freight train, which accidentally blocked the track near San Antonio de Areco. The accident might have been averted had the station agent and the trainman of the freight train done their duty. Laws was in no wise responsible, but was nevertheless arrested and bail was refused, though offered by the manager of the Central Argentine Railway. There was a strike declared at once which would in 24 hours have become general, tying up all the railroads of the republic, but it was "declared off" on receiving the assurance of the Central Argentine officials that they would use their best endeavors to obtain the release of Laws and to secure the passage by Congress of

a bill for the protection of railroad employees who fulfill their duty.

The Bahia Blanca & Northwestern Railroad is building a central produce market in Bahia Blanca, Argentina.

Prizes for Machines and Processes.

Among the special prizes, all of \$400 each, offered for award during the next few years by the French Société d'Encouragement pour l'Industrie Nationale are the following: In 1897, for a motor weighing less than 50 kilograms (110 lbs.) per brake horse power; also in 1897, for the current manufacture of a cast steel or iron endowed with special properties. In 1898, for the invention of new methods, permitting of utilizing petroleum advantageously and without danger, for a publication useful to chemistry or metallurgy, and also for an experimental study of the physical or mechanical properties of one or more metals or alloys in current use. In 1899, for a scientific study of the combustion in furnaces fired by gas producers. Papers and descriptions, which must be written in French, will be received from authors or inventors of all nationalities; but they must be sent by the 31st of December preceding the year for which the prize is offered, to the Secretary, Société d'Encouragement, Rue de Rennes, Paris.

A New Car Barn.

The Chicago City Railway Company has commenced the work of rebuilding the car barn, at the corner of Twenty-first street and Cottage Grove avenue, which was wholly destroyed by fire July 18. The building to be erected will be a car barn to accommodate the rolling stock of the Cottage Grove cable line. It will be of terra cotta, with pressed brick front, and will cost \$75,000. The frontage on Cottage Grove avenue is to be 242 ft., and the building will have a depth of 642 ft., with a wing 150 ft. by 242 ft. The structure will be one story in height. Six feet below the level of the tracks will be a concrete floor underlying the pits for the use of car inspectors, Trackmen in the structure will afford storage room for 450 cars, while a considerable portion of the space in the building will be devoted to other purposes. Here will be the offices of the line, a fire and wreckage patrol station and club quarters for the employees of the line.

Improvement of New York State Canals.

At a meeting of the New York State Canal Board, on August 28, the plans and specifications of State Engineer Adams were adopted, for work on the canals under the \$9,000,000 appropriation, to the amount of \$3,126,301. The work is divided as follows: Eastern Division, Erie Canal, \$626,499; Middle Division, Erie Canal, \$909,017; Western Division, Erie Canal, \$1,033,557; Champlain Canal, \$409,502; Oswego Canal, \$147,726. The work will be advertised by Superintendent of Public Works G. W. Aldridge at an early day.

Trent Valley Canal.

Specifications of work to be done on the section of the Trent Valley Canal known as the Simcoe and Balsam Lake division have just been completed by the Department of Railways and Canals, at Ottawa, Ont. The distance is 13 miles, and the principal works to be built are one hydraulic lift lock with approaches, five ordinary locks, three dams, besides weirs, culverts, bridges, retaining walls and entrance piers. The canal will be 50 ft. wide at the bottom. The contract is to be completed by July 1, 1898.

The Chignecto Ship Railroad.

The English representatives of this company will shortly be in Canada to again press upon the Dominion Government for a renewal of the lapsed subsidy of \$170,000 per annum which the company was to have received for 20 years out of the treasury on completion of the work. Nearly \$3,000,000 has been spent in construction work in New Brunswick and about \$1,500,000 is still required to finish the roads. This, the directors say, they can raise if the charter and subsidy are renewed.

Railroad Taxes in Missouri.

The assessments of railroad property in Missouri, as fixed by the State Board of Equalization for the taxes of 1896, are as follows:

Railroads.....	\$70,916,827
Bridges.....	2,575,000
Telegraph lines.....	947,591
Private cars.....	1,597,500
Total.....	\$76,036,919

This is an increase over the assessment of last year of \$1,595,374. The number of miles of road assessed last year was 6,472, and the number of miles assessed this year 6,514. The total length of new railroad is 54 miles. As against this increase is a loss of 203 miles from corrected measurements of old lines and the abandonment of 13.01 miles of track along the Missouri River between Kansas City and St. Joseph, on account of erosion of banks by the river.

CAR BUILDING.

The St. Charles Car Co. has finished two new passenger cars for the Colorado Central division of the Union Pacific, Denver & Gulf. The cars form part of an order for seven, and it is expected that the others will be finished within two weeks.

Material is being prepared at the South Tacoma car shops of the Northern Pacific for building 120 new flat cars, of 70,000 lbs. capacity. They will be turned out within the next two months. The shops are also increasing the capacity of several hundred cars, to 50,000 instead of 40,000 lbs.

LOCOMOTIVE BUILDING.

The locomotives recently ordered by the Illinois Central were principally for the Chesapeake, Ohio & Southwestern. A part of the engines were already built by the Rogers, and the other 12 ordered are being constructed by the Brooks Locomotive Works.

BRIDGE BUILDING.

Baltimore, Md.—Of the trestles on its Midland and Pittsburgh divisions, which the Baltimore & Ohio is said to be making arrangements to rebuild, two on the Midland Division will be rebuilt with iron and steel.

Councils have passed measures authorizing the Baltimore & Ohio to extend the bridge over its tracks on Fort avenue, eastwardly, not to exceed 450 ft., the work to be done so as not to interfere with travel on the avenue.

Bradford, Pa.—An ordinance has been introduced in Councils instructing the City Engineer to prepare plans and specifications for a new iron bridge on Mechanic street.

Brookside, Pa.—Press reports state that the Lehigh Valley will, in the near future, build a new bridge crossing its tracks at this place.

Cincinnati, O.—The State Board of Public Works has approved the plans for the proposed new steel aqueduct which is to carry the canal over Mitchell avenue. Frank Krug, County Engineer.

Columbus, O.—Reports state that bids for an aqueduct over Columbus feeder to the Ohio Canal were received Aug. 18 as follows: Iron Substructure Co., Columbus, \$1,475; King Bridge Co., Cleveland, O., \$1,525; Penn Bridge Co., Beaver Falls, Pa., \$1,675; Wrought Iron Bridge Co., Canton, O., \$1,490.

Lufkin, Tex.—It is reported that the Commissioners' court has decided to build an iron bridge at Wordan's Ferry.

Minneapolis, Minn.—Bids for the bridge over the railroads at Seventh street were received Aug. 18, as follows: Chicago Bridge and Iron Works, \$32,994; Edge Moor Bridge Works, Wilmington, Del., \$35,280; Gillette-Herzog Mfg. Co., Minneapolis, \$39,999; King Bridge Co., Cleveland, O., \$31,287; Lassic Bridge and Iron Works, Chicago, \$34,500; Milwaukee (Wis.), Bridge and Iron Works, \$29,860; Olaf Hoff, Minneapolis, \$30,800; Toledo (O.) Bridge Co., \$29,890; Wisconsin Bridge and Iron Co., Milwaukee, \$28,970; Wrought Iron Bridge Co., Canton, O., \$31,711; Youngstown (O.) Bridge Co., \$30,635.

Mount City, Ill.—Bids are asked until Sept. 25 for building a steel bridge across Trinity Slough near this city. Major C. F. Humphrey, Depot Q. M., Washington, D. C.

New York.—Chief Engineer Buck, of the new East River Bridge, has made a statement giving the contract cost of the bridge from Oct. 1 for each year until Jan. 1, 1900, the time set for its completion. The report says that the amount yet to be given out in contracts is \$7,500,000. The sum of \$310,000 is to be provided this year, \$3,236,000 for 1897, \$2,537,000 for 1898, and in 1899, \$1,438,000. The statement is as follows:

YEARLY VOTES OF MONEY NECESSARY FROM THE CITIES OF NEW YORK AND BROOKLYN ON THE ASSUMPTION THAT THE NEW EAST RIVER BRIDGE WILL BE READY FOR USE AND OPENED ON JAN. 1, 1900.

Description of work.	Duration of contract.	Beginning of contract.	Completion of contract.	Total.
New York tower foundations.....	10 months.....	Oct. 1, 1896.....	Aug. 1, 1897.....	\$500,000
Brooklyn tower foundations.....	12 ".....	Oct. 1, 1896.....	Oct. 1, 1897.....	250,000
New York anchorage.....	12 ".....	Jan. 1, 1897.....	Jan. 1, 1898.....	820,000
Brooklyn anchorage.....	12 ".....	Jan. 1, 1897.....	Jan. 1, 1898.....	850,000
New York tower, erection.....	6 ".....	Sept. 1, 1897.....	March 1, 1898.....	124,000
Brooklyn tower, steel.....	6 ".....	March 1, 1897.....	Sept. 1, 1897.....	124,000
Brooklyn tower, erection.....	6 ".....	Nov. 1, 1897.....	May 1, 1898.....	124,000
Cable, strands.....	10 ".....	Dec. 1, 1897.....	June 1, 1898.....	450,000
Cable, erection.....	7 ".....	June 1, 1898.....	Jan. 1, 1899.....	300,000
Suspended superstructure, steel.....	10 ".....	April 1, 1898.....	Feb. 1, 1899.....	966,000
Suspended superstructure, erection.....	8 ".....	Feb. 1, 1899.....	Sept. 1, 1899.....	644,000
Approaches, erection.....	11 ".....	Jan. 1, 1898.....	Dec. 1, 1898.....	750,000
Approaches, steel.....	10 ".....	Dec. 1, 1898.....	Sept. 1, 1899.....	520,000
Flooring, painting, etc.....	4 ".....	Sept. 1, 1899.....	Jan. 1, 1900.....	250,000
				\$7,510,000

It has been said by one of the Commissioners that the bridge cannot be completed within four years, unless the money is promptly voted by the cities. At the last meeting the subject of specifications for the stonework of the New York tower was taken up, but referred back to the sub-committee for further consideration.

At a recent meeting of the directors of the New York and New Jersey Bridge Co., Gen. James S. Clarkson was elected President; Louis Windmuller, Vice-President, and Chas. H. Swan, Secretary and Treasurer. Mr. B. F. Shanley, of Newark, was elected a director.

Redding, Cal.—The Board of Supervisors of Shasta County are asking for bids up to Sept. 10 for a three-span steel bridge, with approaches, complete, across the Sacramento River at Ball's Ferry, the bids to be accompanied by plans, specifications and strain sheets of the proposed bridge. A. J. Dryan, Clerk.

St. Catharines, Ont.—Mr. Johnson Clench, County Clerk, is receiving tenders for building an iron bridge in the village of Grimsby, to be 20 ft. wide and 30 ft. long, with stone abutments. Tenderers to furnish their own plans.

Somerville, N. J.—The Board of Somerset County Commissioners are considering the question of building about a dozen bridges at a cost of over \$22,000.

Toronto, Ont.—In connection with the widening of Queen street subway, the City Engineer states that the specifications provide that the present bridges be removed and new ones erected by the railroad companies for and on account of the city. The steel superstructures are to be provided by the city. The estimated cost of the new steel bridge for the Canadian Pacific is \$6,933, and that of the new steel bridge for the Grand Trunk is \$14,760.

Troy, O.—Bids for the swing or hoist bridge over the Miami and Erie Canal, on Plum street, were received Aug. 21, as follows: Massillon (O.) Bridge Co., plan 1, \$3,875; plan 2, \$3,700; Oregonia (O.) Bridge Co., plan 1, \$3,997; Toledo (O.) Bridge Co., plan 1, \$3,800; plan 2, \$4,000; Variety Iron Works, Cleveland, O., plan 1, \$4,200; Youngstown (O.) Bridge Co., plan 1, \$4,500. Massillon Bridge Co. received the contract on plan 1.

Warren, Mass.—Plans have been received for the new iron bridge over the Boston & Albany at East Main street.

Wilkes-Barre, Pa.—Contracts aggregating \$8,510.50 for the erection of 28 bridges in various parts of the county have been let by the Commissioners.

Wyoming, Pa.—Report says that N. B. Rutter and a corps of engineers have begun to lay out the route for the new bridge starting at the foot of Eighth street, this place, and are preparing specifications for the same.

RAILROAD LAW—NOTES OF DECISIONS.

Carriage of Goods and Injuries to Property.

In Kentucky the Court of Appeals holds the evidence that 14 boxes of goods were delivered to a railroad company for shipment; that they were sealed in a car, and that the car, still sealed, was delivered to a connecting line, is sufficient to charge such connecting carrier with the receipt of the 14 boxes.¹

In the Federal Court it is laid down that a stipulation exempting the carrier from liability for loss while the property is in transit, or at places of transshipment, does not relieve the carrier from liability for loss occasioned by its negligent exposure, during a delay in trans-

portation, to dangers that ordinary foresight should have guarded against.²

In Minnesota it is held that a carrier may lawfully insure against liability for loss of goods carried occasioned by the negligence of its servants.³

Injuries to Passengers, Employees and Strangers.

In Iowa it is laid down that recovery for death of a brakeman, alleged to have been due to the negligence of defendants in permitting cobblestones to accumulate on the tracks in a switch yard, is not precluded on the ground that the brakeman assumed the risk therefrom because he was aware that the gravel trains from which the stones fell were in the yard, where it appears that decedent went to work at midnight, and that the company was accustomed to clear off the stones that would fall from the cars from time to time.⁴

In Missouri, evidence that a brakeman while about to make a coupling between moving cars stepped into a ditch which was from four to six inches deep and was injured; that he was not aware of the existence of said ditch; that a rule of defendant railroad company permitted couplings to be made when the cars were moving at a safe rate of speed; and that defendant's foreman who had charge of the roadbed knew of the ditch for several months before the accident—established a *prima facie* case of negligence on the part of defendant.⁵

In Minnesota deceased, a brakeman, after coupling a flat car loaded with rails which projected over the deck of the car was killed through his head being caught and crushed between the flat and a forward car as he attempted to withdraw from between the cars while stooping so as to avoid the rails. The Supreme Court holds that the question of his contributory negligence was for the jury.⁶

In Kansas, after a car inspector had walked over piles of cinders between the tracks for several car lengths inspecting a train, an engine approached on the track adjoining that on which the train stood and while trying to stand in the space between the two trains the cinders gave way and threw him toward the passing train by which he was injured. The Supreme Court holds that

jury to consider the instinct prompting to preservation of life and avoidance of danger.⁷

The Supreme Court of Minnesota decides that where a person bribed a brakeman to permit him to ride among the freight in a freight car, the brakeman and such person thereby became joint trespassers, and the brakeman's implied authority to represent his employer in ejecting such person thereby ceased, so that, unless it appeared that the brakeman received subsequent express authority of eject such person, his doing so in an improper manner was simply of one joint trespasser upon another, and not the act of the railway company.¹³

¹ N. N. & M. V. R. Co. v. Mendell, 34 S. W. Rep., 1,081.

² Thomas v. Lancaster Mills, 71 Fed. Rep., 481.

³ Minn., St. P. & S. S. M. Ry. Co. vs. Home Ins. Co., 66 N. W. Rep., 132.

⁴ Fish v. Ill. Cen. R. Co., 65 N. W. Rep., 995.

⁵ Hallenbeck v. Mo. Pac. R. Co., 34 S. W. Rep., 494.

⁶ Corbin v. W. & St. P. R. Co., 66 N. W. Rep., 271.

⁷ Beaver v. Atchison, L. & S. F. R. Co., 45 Pac. Rep., 1,136.

⁸ Connors v. E. C. & N. R. Co., 36 N. Y. S. 226.

⁹ T. & P. Ry. Co. v. Elliott, 71 Fed. Rep., 378.

¹⁰ Connors v. E. C. & N. R. Co., 36 N. Y. S. 226.

¹¹ St. Louis, I. M. & S. Ry. Co. v. Ross, 33 S. W. Rep., 1,054.

¹² B. & O. S. W. Ry. Co. v. Then, 42 N. E. Rep., 971.

¹³ Brevig v. Ch., St. P., M. & O. Ry. Co., 66 N. W. Rep., 401.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Boston & Albany, quarterly, 2 per cent., payable Sept. 30.

Chicago & Northwestern, quarterly, 1½ per cent., on preferred stock, payable Oct. 5.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Alabama Great Southern, annual, company's office, Birmingham, Ala., Oct. 7.

Ann Arbor, annual, company's office, Durand, Mich., Sept. 19.

Central Vermont, annual, St. Albans, Vt., Sept. 9.

Chicago, Indianapolis & Chattanooga, annual, The Denison, Indianapolis, Ind., Sept. 16.

Chicago, Milwaukee & St. Paul, annual, company's office, Milwaukee, Minn., Sept. 19.

Elgin, Joliet & Eastern, annual, Chicago, Sept. 15.

Great Falls & Canada, annual, company's office, Great Falls, Mont., Sept. 11.

Iowa Central, annual, Chicago, Sept. 4.

Lake Erie & Western, annual, company's office, Peoria, Ill., Oct. 7.

Louisville, New Albany & Chicago, annual, New York, Sept. 9.

Minneapolis & St. Louis, annual, company's office Minneapolis, Minn., Oct. 6.

Nashville, Chattanooga & St. Louis, annual, Nashville, Tenn., Sept. 9.

St. Louis Southwestern, annual, company's office, St. Louis, Mo., Oct. 6.

Toledo & Ohio Central, annual, company's office, Toledo, O., Sept. 7.

Toledo, St. Louis & Kansas City, annual, company's office, Toledo, O., Sept. 9.

Wabash, annual, company's office, St. Louis, Mo., Sept. 8.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The **American Street Railway Association** will hold its annual convention at St. Louis on Oct. 24 and 25.

The **Roadmasters' Association of America** will hold its next annual meeting at the Cataract Hotel, Niagara Falls, N. Y., beginning Sept. 8.

The **Traveling Engineers' Association** will hold its next annual meeting at Minneapolis, Minn., commencing Sept. 8.

The **American Institute of Mining Engineers** will hold its annual meeting in Denver, Col., beginning on Sept. 21. For provisional programme see issue of July 24, page 530.

The **American Society of Railroad Superintendents** will hold its next annual convention at Niagara Falls, N. Y., beginning Sept. 9.

The **American Association of General Passenger Ticket Agents** will hold its next annual convention at Atlantic City, N. J., beginning Sept. 15.

The **Travelling Passenger Agents' Association** will hold its next annual convention at St. Louis, Mo., beginning Sept. 29.

The **American Railway Association** will hold its next annual convention at New York City, beginning Oct. 7.

The **Freight Claim Association** will hold its next annual convention at The Jefferson, Richmond, Va., beginning Oct. 7.

The **Association of Railway Superintendents of Bridges and Buildings** will hold its annual meeting at Chicago on Oct. 20. For programme see issue of Aug. 7, page 560.

The **Master Car & Locomotive Painters' Association** will hold its annual meeting at the Park Avenue Hotel, New York City, beginning Sept. 9. For programme see issue of Aug. 7, page 560.

The **Central Railway Club**.

The next meeting will be held at the Hotel Iroquois, on Friday, Sept. 11, 1896, at 2 p. m. The reports to be submitted are "Car Roofs." Committee—E. A. Miller, Chairman; S. A. Crone, E. A. Mitchell, A. C. Robson, Robert Potts, Thomas Sills. "Comparative First Cost of Maintenance of Plastered Iron Locomotive Boiler Jackets and the Plain Sheet Iron or Steel, Painted." Committee—J. H. Moore, Chairman; Amos Gould, P. E. Garrison, F. B. Griffith, John Campbell, H. Tandy. The topical discussion will be on report of committee on "Tool Rooms in Machine Shops and Best Methods of Handling Them," and on topical questions proposed by members.

The **American Society of Railroad Superintendents**.

The twenty-sixth meeting of this society will be held at the International Hotel, Niagara Falls, on Wednesday and Thursday, Sept. 9 and 10.

The first session will be on Wednesday, at 9:30 a. m., and an address is expected at that time from John G. Milburn, Esq., of Buffalo. Besides the routine business, there will be reports from the committees on Roadway, Seely Dunn, Chairman; on Machinery, W. F. Potter, Chairman; on Transportation, T. F. Whittlesey, Chairman, and on Signaling, W. L. Derr, Chairman. These will be followed by general discussion of the subjects presented by the reports. In the afternoon there

will be an excursion to the power plant of the Niagara Electric Company, to be followed by a carriage ride around Goat Island, returning to the hotel in good season for dinner.

The fifth annual dinner of the society will be given at the International Hotel Wednesday evening, and members and their guests are expected to bring their ladies.

On Thursday the society will meet at 9 a. m., and there will be a general discussion on the report presented at the last meeting on the relations between railroads and their employees, including methods of training and discipline.

At 2 p. m. on Thursday an excursion will start down the new Gorge road, on the American side of the falls, past the rapids and whirlpool to Lewiston, by the courtesy of the President of the road, Mr. J. M. Brinker, returning either by the same route or crossing the Niagara River at Lewiston to Queenstown, on the Canadian side, and thence along the heights, via the Niagara Falls, Park and River Electric Railway, back to the Canadian Falls. The Committee of Arrangements have under consideration other excursions for Friday, for those members who can arrange to remain over that day.

All Railroad Superintendents are invited to be present at this meeting, and it is especially desired that they bring their ladies with them. Reduced rates will be given at the International Hotel, room with bath \$4, and without bath \$3.50. Every arrangement has been made for the comfort and convenience of guests, and for the sessions of the society. The house is delightfully situated directly alongside the American Falls, and the views from the rooms of the hotel are unsurpassed in beauty and grandeur.

American Society of Civil Engineers.

The August issue of the *Proceedings* contains the official report of the San Francisco Convention of the society.

The first regular meeting of the season of 1896-7 will be held Sept. 2, and a paper will be presented by E. H. Hooper, Ph. D., entitled "The Suspension of Solids and Flowing Water." This paper is printed in the August *Proceedings*, where it occupies 86 pages. Presumably it will not be read in full at the meeting of Sept. 2. At the meeting of the 16th a paper will be presented by Mr. E. Sterman Gould, Member of the Society on "New Water Works of Havana, Cuba," and at the meeting of Oct. 7, the paper will be on "The Reconstruction of the Grand River Bridge," by Mr. W. A. Rogers, Junior of the society.

SICKELS, THE INVENTOR.

The same issue of the *proceedings* contains a memoir of Mr. F. E. Sickels, who died March 9, 1895, and who was elected a member of the society Jan. 7, 1891. The memoir is by Professor Thurston. Mr. Sickels was 76 years old when he died. He was famous as the inventor of the Sickels Cut-Off and of many other ingenious devices. Professor Thurston says that "the modern factory stationary steam engine is substantially the work, in its evolution from the old Newcomen engine of 190 years ago, of three men: James Watt, who converted the machine of which Newcomen was the real inventor, from its primitive and enormously wasteful form into a comparatively efficient apparatus by securing reduction of internal wastes from about 95 per cent. to perhaps 30 or 40 per cent. by the adoption of a condenser separate from the working cylinder and by the use of a steam jacket, while improving at the same time its thermodynamic action, to such extent as the devices available at the time permitted, by the employment of a cut-off arrangement acting on a crude system of valve gearing; Frederick Sickels, who produced the first practicable drop cut-off gearing for the rotary engine; and George Corliss, who devised a refined and specially contrived type of engine peculiarly adapted to the successful utilization of the ideas of Watt and of Sickels, and the highest refinement of steam engine construction of the time. Watt was unable to avail himself fully of the advantages of his own plan of expansion of steam by closure of the induction valve at an early point in the stroke of the piston in consequence of two facts. Steam pressure was always too low in his engines to permit any considerable expansion, and even were the pressures higher, the rudeness of his devices and the ineffectiveness of his provisions for insuring steady rotation of the engine shaft precluded the employment of now familiar methods of expanding steam behind the piston. Sickels provided a system of construction and operation which permitted the detachment of the valve from its moving mechanism, and allowed it to drop back into its seat, thus almost instantly effecting closure at any desired point; while the use of a dash-pot containing water, oil or air checked its fall as it approached its seat closely, and thus evading the danger and annoyance consequent upon unrestricted impact. Corliss perfected the engine later by adopting reduced clearances, partially balanced sliding valves moving with accelerated or retarded velocities close to the cylinder; a steam and an exhaust valve at each end, opening quickly and widely, detached automatically, as previously practiced by Sickels, dropping quickly, closing instantly, and moving comparatively little while closed. The invention of Sickels was an essential element of success in the steam engine of the 19th century, and the name of Frederick Ellsworth Sickels rightfully stands beside that of James Watt, both as an inventor and as a builder, for he built numerous engines, stationary and marine, and gave a half-century of busy life to the work.

"Sickels made other inventions, less well known simply because the greater light of the more important invention obscured that of the lesser ones. He never received full, or even moderate, compensation for the cut-off, or for any other of his characteristically ingenious and valuable devices. Perhaps the most remarkable of these minor devices, both in the eye of the inventor and in the estimation of others, was his steam-steering gear. This invention was first recognized publicly when exhibited at the London International Exhibition of 1862.

"Sickels patented altogether about 30 devices, many being improvements in detail upon his principal inventions. He lived and died, however, a 'poor inventor,' spending the comparatively small returns from his invaluable work, as fast as received, in the prosecution of experiments and in bringing out new devices. He deserved honors second only to those accorded James Watt and he met the fate of the prophet of the proverb who had honor except in his own country; but Sickels was little honored, even abroad. He lived and died almost unknown outside his profession, and so modest, retiring, and disinclined to urge his claims, that he was not extensively acquainted in his own guild. He spent his life mainly in the development and introduction of his inventions, assisted in legal matters by one of the ablest patent lawyers of the time, Mr. Edwin N. Dickinson, and in designing by a brother, Theophilus Sickels, M. Am. Soc. C. E., a well-known member of the engineering profession. After the expiration of the more im-

portant Sickels' patents, the brothers worked together in the construction of the Omaha Bridge across the Missouri River, and, later, the great inventor became the Chief Engineer of the Kansas City Water Works, which position he held at the time of his death."

PERSONAL.

—Mr. C. O. Skidmore, Master Mechanic of the New York, Philadelphia & Norfolk Railroad, has resigned.

—Mr. George Strong has been appointed Auditor of the Fort Worth & Denver City Company, vice Mr. W. A. Ross, deceased.

—Mr. Edward Clarke has been appointed Freight Claim Agent of the Burlington & Missouri River, with headquarters at Omaha.

—Mr. G. G. Lynch has been appointed Assistant Superintendent of Transportation on the Atlantic Coast Line, with office at Florence, S. C.

—Mr. S. B. Hynes, of La Porte, Ind., has been appointed Superintendent of the Los Angeles Terminal. Mr. Hynes was formerly Superintendent of the California Southern.

—Mr. J. F. M. McKibben, Auditor of the Atchison, Topeka & Santa Fe, with headquarters at Topeka, was thrown from a broncho at New Castle, Col., Aug. 24, and died, from the injuries sustained, on the following day. He had been in the auditing department of the Atchison for six years.

—Mr. J. D. Mackenzie, Westbound Agent of the Anchor Line of Lake steamships, has resigned on account of ill health, and will go to the north of Scotland. Mr. Mackenzie has been with the Anchor Line, formerly the Lake Superior Transit Co., for the last 10 years, and for four years has been located at Duluth as Westbound Agent.

—Mr. Albert E. Little, who has been elected Treasurer of the new Northern Pacific, is the eldest son of Mr. Stephen Little, the expert accountant and Comptroller of the Denver & Rio Grande. Mr. A. E. Little has served as the principal assistant to his father in some of his most important investigations, and has made expert examinations for bankers and others.

—Mr. Chas. F. Cooney, the newly elected Secretary of the Northern Pacific, has been for several years past Secretary to Mr. E. D. Adams, Chairman of the Northern Pacific Reorganization Committee, and in that capacity has had occasion to become very familiar with the company's affairs. For nearly ten years he was in the banking office of Winslow, Lanier & Co., of New York City.

—Mr. Willard W. Crittenden, of Oswayo, Pa., has been appointed General Superintendent, and Mr. David N. Rumsey, of the same town, Auditor and General Freight and Passenger Agent of the New York & Pennsylvania. These two officers held similar positions on the Olean, Oswayo & Eastern, the New York & Pennsylvania being practically an extension of that line. Ultimately a consolidated company will be formed.

—Mr. S. D. Parkhurst, Chief Clerk of the St. Paul & Duluth general freight department, has resigned to accept the position of General Freight Agent of the Mason City and Fort Dodge, succeeding Mr. James Mahoney. The change goes into effect Sept. 1. Mr. Parkhurst entered St. Paul & Duluth service Jan. 1, 1896, prior to which time he was Chief Clerk to the Assistant General Freight Agent of the Chicago Great Western.

—Mr. John Houston died at his home, Arlington, N. J., last Sunday in the 69th year of his age. He was born in Edinburgh, Scotland, but came to the United States in 1858. He was one of the old members of the American Society of Civil Engineers, having become a member in 1868. He had had a varied and honored experience as a civil engineer. He was Chief Engineer of the Erie Railroad from 1851 to 1862, during which time the Bergen tunnel was built. He was Chief Engineer of the La Guayra & Caracas Railroad in Venezuela. He was also Chief Engineer of the Majillones & Caracoles Railroad and had done important work of construction in Peru, Bolivia and Ecuador.

ELECTIONS AND APPOINTMENTS.

Grand Trunk.—The following appointments are announced: Mr. Wm. McNab, Assistant Engineer, in charge of the engineering and drawing office at Montreal; Mr. Robert Armour, Assistant Engineer, eastern division, office at Montreal; Mr. W. P. Chapman, Assistant Engineer, northern division, office at Allendale, Ont.; Mr. H. B. Hollinshead, Assistant Engineer, middle division, office at London, Ont.; Mr. George Masson, Assistant Engineer, western division, office at Detroit, Mich.

Gulf & Ship Island.—At the meeting of the stockholders held in Gulfport, Miss., Aug. 19, the following board of directors was elected: J. T. Jones, T. J. Powers, W. L. Nugent, Herman Clark, C. P. Collins, C. V. Merrick, W. W. Bell, S. S. Bullis, W. H. Hardy.

Gulf, Colorado & Santa Fe.—The resignation of F. N. Bisbee, Superintendent of Tracks, Bridges and Buildings of the Gulf, Colorado & Santa Fe, has caused a number of changes. The office held by Mr. Bisbee has been abolished, and Mr. C. W. F. Felt, Resident Engineer, is promoted to the re-created office of Chief Engineer, with headquarters in Galveston. He will continue to perform the duties of Resident Engineer. Mr. J. J. Hess, Roadmaster from Cleburne north, has been appointed General Roadmaster, and Mr. D. W. Lahey, who has been Bridge Master for the same division, will be General Bridge Master.

New England.—The position of General Baggage Agent has been abolished, and the business of that department has been placed in charge of the General Passenger Agent. George F. Ingalls, who has been General Baggage Agent, has been transferred to the operating department.

Northern Pacific.—As a matter of record, we give below the list of executive officers, as announced by the new company, which assumed the control of the property on Sept. 1: Edwin W. Winter, President, St. Paul; Charles F. Cooney, Secretary, New York; George H. Earl, Assistant Secretary, St. Paul; Albert E. Little, Treasurer, New York; Charles A. Clark, Assistant Treasurer, St. Paul; John Scott, Comptroller, St. Paul. The following appointments are announced by President Winter: J. W. Kendrick, General Manager, St. Paul; J. M. Hannaford, General Traffic Manager, St. Paul; Francis Lynde Stetson, General Counsel, New York; Charles W. Bunn, General Counsel, St. Paul; William H. Phipps, Land Commissioner, St. Paul; Thomas

Cooper, Assistant Land Commissioner, Tacoma, Wash.; G. S. Fernald, Tax Commissioner, St. Paul.

The General Manager's appointments are: M. C. Kimberly, General Superintendent; E. H. McHenry, Chief Engineer; John Hickey, Superintendent of Motive Power, Machinery and Rolling Stock; F. G. Frest, Purchasing Agent, St. Paul; O. G. Greene, Superintendent of Telegraph; R. M. de Lambert, General Storekeeper, all at St. Paul.

General Superintendent Kimberly has appointed W. G. Pearce Assistant General Superintendent, having jurisdiction over lines west of Billings, Mont., with headquarters at Tacoma, Wash.

The Chief Engineer announced the following appointments: W. L. Darling, Division Engineer, with headquarters at St. Paul, Minn., in charge of all engineering matters on lines east of Billings, Mont.; C. S. Bihler, Division Engineer, with headquarters at Tacoma, Wash., in charge of all engineering matters on lines west of Billings, Mont.; K. E. Hilgard, Engineer of Bridges, with headquarters at St. Paul, Minn., in charge of special bridge designing, including shop construction and erection of special structures. The Division Engineers and Engineer of Bridges will report to the Chief Engineer at St. Paul. Assistant Engineers and other employees of the engineering department, unless otherwise directed, will report to the Division Engineers.

Oregon Railroad & Navigation Co.—The following is a more complete list of the officers of the new company than was given last week: E. McNeill, President and General Manager; W. W. Cotton, General Attorney; E. S. Benson, General Auditor; J. G. Woodworth, Assistant to President; B. Campbell, Traffic Manager; D. C. O'Reilly, Assistant General Freight Agent; W. H. Hurlburt, General Passenger Agent; J. P. O'Brien, Superintendent Rail Line; E. J. Rathbone, Superintendent Water Lines; Goodall, Perkins & Co., Superintendents Ocean Division; W. H. Kennedy, Chief Engineer; J. F. Graham, Master Mechanic; F. G. Wheeler, Purchasing Agent; J. F. Meyer, Car Service Agent; A. S. Watt, Land and Tax Agent; D. E. Hall, Claim Agent. The general headquarters remain at Portland, Or.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

Asheboro & Montgomery.—A. F. Page, of Aberdeen, N. C., who is building this road, states that of 26 miles of the road (which is a branch of the Aberdeen & West End), between Starr and Asheboro, N. C., 18 miles are graded and six miles of rails laid, on which trains are running.

Astoria & Goble.—The Columbia Stone & Contract Company, of Portland, Or., has a \$60,000 contract to build 15 miles of the grade of this road, across the tide lands back of Knappa, which will require the building of an embankment from 5 to 15 ft. in height and necessitate the removal of 600,000 cu. yds. of earth. The road will connect Rainier, in Columbia County, Oregon, with Astoria, about 46 miles.

Belleville Central.—Enough of the extension to Pine Grove Mills is completed to admit of train service as far as Bloom, Pa., about a mile from Struble's Station. It is expected that the extension to Pine Grove Mills will be followed by a further extension across the mountain to a connection with the Bell's Gap road.

Canadian Pacific.—Mr. William Whyte, the General Superintendent of the Western Division, spoke at some length recently with a local newspaper, in regard to the company's plans for building the Crow's Nest line. He said, substantially: "We have already had surveys of that route made, and we are fully acquainted with its topographical features. We can get much better grades by the Crow's Nest pass than we now have by the main line over the Rockies. By the Crow's Nest pass we would have a maximum grade of 1 to 1½ per cent. on the eastern side of the mountains and from 2 to 2½ per cent. on the western side. We now have a 4½ per cent. grade by the main line on the western side of the mountains. By the Crow's Nest route we would cut down the grades more than half. Our expert is now making a thorough examination of the coal fields there. I think there is little question as to the quantity of coal. The main point is, shall we get a coal from which we can make coke for the smelters in British Columbia? When the Dominion Parliament meets we shall ask for assistance from the Government."

Carolina, Tennessee & Ohio.—Work is progressing favorably on the road between Wilmington and Southport, N. C. Nearly 14 miles, or about half of the roadway, is graded. There are now more than 300 hands at work on the line. Mr. J. A. Pullen, Gillis & Black have received new sub-contracts for grading.

Columbia & Red Mountain.—The grading of this road, which is a branch of the Spokane Falls & Northern, into British Columbia, is being rapidly pushed, and it is expected that track-laying will begin by September 10. The road will be about 23 miles long, from Northport, Wash., to Rossland, B. C., with many sharp curves and steep grades. The grades from Northport to Rossland will be three per cent. The road will reach all the mines of the Trail Creek district at Rossland.

Drummond County.—Public notice is given that the company will apply to the Dominion Parliament at its next session, for power to construct an extension commencing at the City of St. Hyacinthe, P. Que., to the town of St. Lambert, opposite the City of Montreal, and for power and authority to construct a bridge over the River St. Lawrence.

Hutchinson & Southern.—The track-laying will be commenced this week on the extension south of Cameron, Kan. This new line is about 23 miles long, from Cameron to a junction with the Chicago, Rock Island & Pacific at or near Pond Creek, O. T. The line was located in 1893 under a charter granted by Act of Congress before the "Strip" was opened for settlement, by H. L. Jackson, then, as now, Chief Engineer. It is almost an air line, and the grade is light; at no place exceeding one per cent. The extension is being made by the Receiver, L. E. Walker, under an order of the United States Court, and the contract has been let to W. A. Bradford, Jr. & Co., whose address is Hutchinson, Kan. About four miles of grading is already completed, and track-laying will follow the graders and bridge gang closely. A considerable portion of the work is being done with the "New Era" grading machine," which has proven very satisfactory so far.

Kansas City, Shreveport & Gulf.—A newspaper report, that construction work on this line, south of Shreveport, La., now employing some thousands of men, would be suspended, and the line not completed, gained considerable circulation last week although promptly denied by General Manager F. S. Hammond. Mr. Hammond states that track-laying will reach Sabine Parish, Sept. 15, and the grading from there to

Lake Charles will be pushed with all possible vigor. Track-laying from Lake Charles and Beaumont north will commence as soon as grading and bridges are finished. Contracts covering shipments of 12,000 tons of rails from Johnstown, Pa., for Lake Charles delivery, have been awarded the Southern Pacific Company.

Mexican Roads.—A survey has just been completed for a railroad from Oaxaca to connect with the Isthmus of Tehuantepec road. It is stated that the intention is to extend the line from Oaxaca to Durango, passing through the City of Mexico. At Durango the road will connect with the Mexican International road, which is operated in connection with the Southern Pacific. It is stated that Mr. C. P. Huntington is interested in the project.

Montgomery, Tuscaloosa & St. Louis.—A. R. Littlejohn, London, England, is reported to be going over the route of this road, gathering information with a view of reporting to a London syndicate, which, it is reported, may take the bonds to complete its extension. The Mobile & Ohio has a large interest in the property.

Newtown Creek Terminal.—The New York State Railroad Commissioners gave a hearing at Albany last week on the application of the company for permission to build its proposed road. The company filed a petition in which it pointed out that all that part of the city of Brooklyn from the East River to the head water of Newtown Creek, a distance of some three miles, is adapted only for manufacturing and allied business which handle goods in large bulk. It is already very largely so occupied, but there remain large tracts of land, much of which is unsuitable for habitation, but entirely suitable and desirable for manufacturing purposes. The city of Brooklyn is cut off from all the trunk lines by reason of its location, and the only means possible for overcoming the disadvantages of its situation is the development of freight terminals at suitable points. At the present time there is no railroad freight terminal anywhere along Newtown Creek nor on the East River within a considerable distance from the mouth of the creek. The company proposes to establish a freight terminal as set forth, to make direct rail connection with as many factories as possible and to offer the facilities of a nearby freight terminal to all the immediate neighborhood.

Peoria & Pekin Union.—The company has this week opened the new second track between Wesley Junction and the Peoria & Eastern track. The new track is eight miles long. This line is used as a terminal line at Peoria, Ill., by eight roads.

Philadelphia & Reading.—The company is laying two additional tracks on its New York Division, between Sixteenth street and Wayne Junction, Philadelphia. The two tracks in the center will be used entirely for express trains, while the outer tracks will be for way trains. To obviate delays and to lessen danger all freight traffic will be taken from these tracks as soon as possible and all cross-overs will be removed excepting such as are really necessary. On the Norristown branch an additional track will be laid as far as Twenty-second street to facilitate the handling of freight from the new station recently established there. In place of the present signal tower at the junction of the branches a large tower with 48 levers is to be erected.

Quakertown & Eastern.—Contractor John Jamison, of Philadelphia, has a large force grading for this new railroad between Quakertown and Easton, Pa., the work now going on being between Richlandtown and Springtown. The road will be about 22 miles in length when completed all the way to Easton. It is the present intention to extend it to Durham Furnace only, where connections can be made with the Pennsylvania's Belvidere branch by crossing the Delaware. The line, when completed, according to the present plans, will follow the west bank of the Delaware from Durham Furnace to Easton, passing through Richlandtown, Springtown and Rieglesville. It goes through a section heretofore without railroad facilities, the entire distance from Quakertown to the Delaware River being a rich farming community. At Quakertown the new road will connect with the Reading's North Penn branch, thus shortening the route between Easton and Philadelphia some 15 miles. The road is being built almost entirely by capital subscribed by people residing along the route.

Rio Grande, Sierra Madre & Pacific.—Grading has been begun on this road in Mexico, the firms having construction contracts at present being: Gilbert Webb, Juarez, Mexico; Richard Caples, El Paso, Texas; W. C. Bradbury & Co., Denver, Col.; Farnsworth, Beck and others of the Mormon Colonies in Mexico, State of Chihuahua. About 100 men are at work at present, but this number will be largely increased in a very short time. The road is to extend from Ciudad Juarez in a general southwesterly course via the San Blas Mountains, Lake Guzman, Sabinas and San Pedro mining region to vicinity of Casas Grandes; a distance of 156 miles. The permanent location of the line is now nearly completed. The officers expect to begin laying track in October next. The character of the work is generally light. The bridging will be bent and pile trestles. J. Fewson Smith, of the railroad, is Chief Engineer, with headquarters at Ciudad Juarez, Mexico. The road is being built by the Sierra Madre Construction Company, whose officers are A. Foster Higgins, President; Solon Humphreys, Treasurer, and George Rowland, Secretary. Its New York offices are at 54 Exchange Place.

St. Lawrence & Adirondack.—The new branch from Beauharnois to Caughnawaga in Canada, has been formally opened. This completes the new short route of this road to Montreal and makes a difference of 30 minutes in time in the train service between New York and Montreal. The new branch is 13 miles long and runs along the St. Lawrence River. Formerly trains have used the tracks of the Grand Trunk road from Beauharnois to the point eight miles from Montreal where the Canadian Pacific line is taken into the city.

Southern Pacific.—The four trustees of Pomona Cal., last week, granted the company authority to build a single track through the city streets to connect a new branch with the main line. This will enable it to operate trains into Pomona over the new branch road, via Covina, San Dimas and Lordsburg. It is said this branch road will not be extended from Pomona to Chino and Riverside until next spring.

Yankton, Norfolk & Southwestern.—A mortgage for \$1,000,000 was recorded in the various counties along the line of the proposed road in Nebraska last week. It is executed in favor of the London Railway Land Syndicate. The road was graded three years ago, but work was suspended owing to the failure of J. T. M. Pierce. His creditors have given up the project, and with the assistance of other capital, will complete the road, from the Missouri River to Norfolk.

The officers state that active work on the road and bridge across the Missouri River, at Yankton, will be

commenced within a month. Nearly the entire summer has been taken up by the company in reorganizing, resurveying and voting bonds along the route between Yankton and Norfolk, Neb.

A mortgage for \$100,000 was filed with the Register of Deeds of Yankton County on Aug. 26, covering a 3½ mile strip of roadbed on the Yankton side of the Missouri River. The mortgage is in favor of the London Railway syndicate, and was executed by the local railroad organization claiming title to this roadbed. The document is executed by W. H. Edmunds, President.

Electric Railroad Construction.

Allegheny, Pa.—The Lacock Street Railroad Co., with a capital of \$12,000, has been chartered to build a line two miles long. The directors are: Joshua Rhodes, President; William Bradford, M. W. Brannen, Pittsburgh; Samuel H. Goss, Allegheny, and James A. McDevitt, Lancaster.

Boston, Mass.—It is hoped by the members of the Transit Commission that cars will be running in the subway south of Park street by Jan. 1. The first section of the subway is the only one yet completed. Sections two, three, four and six are all under construction at present; bids were opened for section five on Aug. 27, and will be opened for section 10 on Sept. 10.

Bradford, Pa.—The Council has passed an ordinance granting the Bradford Electric Street Railway Co. a franchise for a line from the American House to Clarkdale Park.

Chicago, Ill.—It has been announced that the South Chicago City Railway and the Calumet Electric Railway will make improvements this fall to cost \$300,000. New rails will be laid, tracks rebalasted, and an extensive interlocking switching system put in at the junction of Sixty-fourth street and Stony Island avenue.

Connellsville, Pa.—The Connellsville Suburban Railway Co. has been incorporated, with a capital of \$25,000, to build and operate an electric street railroad between Connellsville and Greater Connellsville. The right of way has been granted, and surveys will be made at once. The following officers and directors of the company have been elected: President, S. R. Slaymaker; Vice-President, Joseph Soisson; Secretary and Treasurer, Robert W. Soisson; Chief Engineer and Superintendent, William Henderson; Directors, John D. Frisbee, John F. Soisson, Joseph Soisson, S. R. Slaymaker, P. S. Newmeyer, Robert W. Soisson and John F. Barry.

Greenbush, N. Y.—A company has been formed to build and operate an electric road between this place and Nassau, 12 miles. The capital is \$120,000. The incorporators are Jesse P. Van Ness, William H. Nichols, Gardner Morey, Lewis N. S. Miller, John F. Lape, Sylvanus C. Curran, John H. Finnerty, Fred. Carr, James Gray, Bradford R. Lansing, J. Perry Beaver, George W. Witbeck, Thomas D. James and Joel T. Morey.

Hackensack, N. J.—An ordinance was passed on Aug. 26, by the Hasbrouck Heights Council, granting a right of way through the borough to the Union Traction Co., for an electric line. The route will be through the borough on the boulevard, north to Lodi avenue; by this avenue east, crossing the New Jersey & New York Railroad; then parallel with the above road to Hackensack, and then through Green street to Essex. This practically assures the construction of the line to Hackensack.

Hamilton, Ont.—The Cataract Power Co., of this place, is trying to obtain a right of way for an electric road between Hamilton and Niagara Falls. At Deceus Falls a central power station is contemplated, on the site now occupied by the Morning Star Grist mill, where there is abundance of power.

Holbrook, Mass.—Plans are nearly completed for the organization of the Randolph, Holbrook & Nantasket Beach electric street railroad. The road will be operated by the Braintree & Weymouth street railroad system. The latter has just completed a power station at East Braintree, having in view the plan of connecting the towns of Randolph and Holbrook with North and South Weymouth, and furnishing a direct route to Nantasket Beach.

Madison, Wis.—The Milwaukee, Racine & Kenosha Electric Railway Co. has been incorporated at this place, with a capital stock of \$250,000. The incorporators are George H. Hopper, Edward C. Deane and Park Phipps.

New York City.—The Third Avenue Railroad Co. has applied to the State Board of Railroad Commissioners for permission to operate an electric line north of 116th street.

Parkville, Md.—A committee of citizens has been appointed to wait upon the City Passenger Railroad Co. and induce the latter to extend its line to the Big Gunpowder Falls, 10 miles from Baltimore, on the Harford Road. The right of way has been secured for a 60-ft. avenue parallel and adjacent to the Harford road, extending from Clifton Park to Taylor avenue, at Parkville.

Philadelphia, Pa.—President Widener, of the Philadelphia Traction Co., has announced to the Union Traction Company's directors that the improvements and new work on his line have been completed at a cost of \$350,000 less than the original estimate of \$400,000. As a guarantee that the cost would not exceed this figure, the directors of the Philadelphia Traction Co. were required to give personal bonds, the surrender of which is now requested.

The grading of the roadbed for the Fairmount Park Electric line, which extends from the entrance of West Park, at Belmont and Elm avenues, to the Schuylkill River, has been completed. It is expected that the entire line will be completed and in operation within six weeks. The work on the foundations of the bridge across the Schuylkill is being pushed rapidly, and some of the piers in the stream are already built to a point above the surface of the water.

Pittsburgh, Pa.—The Consolidated Traction Co. is converting the old Fifth avenue cable road into an electric line. Sixty days has been allowed for the work to be completed, and a large number of men are now employed both night and day.

Providence, R. I.—The Union Railroad Co. is pushing work on the extension of its Knightsville line, which, when finished, will reach Meshanticut Park, a little over a mile beyond the present terminus. Before winter arrives the proposed Douglass avenue extension will probably be begun. This is about half a mile long, and will reach from the terminus of the Admiral street route to Veazie street at Douglass avenue.

Rockville, Conn.—The Hartford, Manchester & Rockville Tramway Co. has presented its final report in

regard to building an extension from Talcottville to Rockville. The company has a charter to build by way of Vernon Center, but it now states that it will not build a road by this route, owing to the expensive construction. The company estimates that it would cost \$7,000 more a year to operate this route than it would the Burke Hill route, which it is ready to build immediately.

St. Louis, Mo.—The owners of the franchise for the cross-county electric road, which is to run from Webster to Baden around the western limits of the city, are reported to be much encouraged with the outlook so far. A plan is on foot for an extension of the Baden electric road as far as the Chain of Rocks, and if possible to Spanish Lake.

St. Paul, Minn.—It is stated that a company has been organized to build an electric road between this city and Superior, Wis., about 169 miles. The company is now seeking a franchise for the use of certain streets in St. Paul, in the neighborhood of the proposed terminal. Surveys have already been made of the proposed route.

Salt Lake City, Utah.—Work is to be begun this fall on the Salt Lake City & Ogden electric road, to operate between the two cities, a distance of 35 miles. The company was organized and incorporated last March, with a capital stock of \$800,000. Mr. B. O. Boswell is at present locating the most feasible route over which the line for conducting electricity to Salt Lake City from the Pioneer Electric Power Co. could be built. It is said that the road will be graded in from Farmington to Ogden very shortly, and that it will be equipped and put in operation soon after the completion of the power works.

Uniontown, Pa.—The United States & Victor Electric Co. will build the electric lines to connect Fairchance and intermediate points with this place. The people of Fairchance have subscribed \$14,000 toward the construction of the line.

Waterbury, Conn.—A company will probably soon be organized in this place for building a three-rail electric line from Torrington to Unionville, Conn., passing through Harwinton Center. It is stated that a survey will be made at once. Two other lines are proposed from Torrington, one to Bantam Lake and the other to Highland Lake, Winsted.

GENERAL RAILROAD NEWS.

Abbeville & Waycross.—The Georgia & Alabama has secured control of this road, extending from Abbeville, Ga., to Fitzgerald, Ga., 22 miles, and it will hereafter be known as the Fitzgerald branch of the Georgia & Alabama. The latter company several months ago secured control of all of the bonds and stock of the Abbeville & Waycross road, but up to the present time the line has been operated as a separate and independent road. By this consolidation the mileage of the Georgia & Alabama is increased to 362 miles operated.

Arkansas Southern.—On Aug. 20 an amendment to the charter of this road was filed at Little Rock, Ark. The amendment increased the capital stock from \$150,000 to \$160,000, and the number of directors from five to eleven.

Brooklyn Elevated.—The report for the year to June 30, is as follows:

	1896.	1895.	Inc. or dec.
Gross earn	\$1,561,758	\$1,531,497	D. \$30,261
Oper. exp.	1,102,207	1,086,584	I. 15,623
Net earn	\$759,551	\$844,913	D. \$85,362
Other income	23	4,462	D. 4,439
Total	\$759,579	\$849,375	D. \$89,796
Fixed charges	860,276	846,934	I. 13,342
Deficit	\$100,697	\$2,411	I. \$103,108
Total deficit	54,624	46,073	I. 8,551
Betterments	86,312	25,008	I. 61,304

*Surplus.

Canadian Pacific.—The July earnings are reported as follows:

	1896.	1895.	1894.
Gross earn	\$1,803,575	\$1,543,544	\$1,517,609
Oper. exp.	1,044,340	985,517	1,042,341
Net earn	\$699,235	\$558,027	\$475,268
P. c. exp. to gross	57 7/8	63 7/8	68 7/8
Net 7 months	\$3,808,142	\$3,096,290	\$2,760,498

The net earnings in July, 1893, were \$699,937 and in 1892, \$681,943.

Chicago, Milwaukee & St. Paul.—The earnings for July for three years were:

	1896.	1895.	1894.
Gross earn	\$2,546,226	\$2,289,240	\$1,779,227
Oper. exp.	1,725,364	1,557,247	1,401,056
Net earn	\$820,862	\$736,993	\$378,171
P. c. exp. to gross	67 3/4	67 3/4	79 3/4
Net, seven months	5,923,287	4,694,547	5,019,134

The earnings in July, 1893, were \$736,334; in 1892, \$906,401; in 1891, \$725,312; in 1890, \$666,726.

Pennsylvania.—The earnings of the lines directly operated east of Pittsburgh and Erie, for July, were:

	1896.	1895.	1894.
Gross earn	\$5,258,595	\$5,415,395	\$1,759,525
Oper. exp.	3,795,964	3,855,564	3,350,509
Net earn	\$1,462,631	\$1,559,831	\$1,408,916
P. c. exp. to gross	72 3/4	71 3/4	70 3/4
Net, seven months	8,975,187	9,205,187	8,275,535

The Pennsylvania Railroad earned net in July, 1893, \$1,530,507; in 1892, \$1,392,265. Lines directly operated west of Pittsburgh and Erie report for July gross decreased \$330,900; net decreased \$247,900; and for the seven months gross increased \$378,400; net increased \$61,800. All lines east of Pittsburgh and Erie report for July gross decreased \$158,600; net decreased \$92,100; and for the seven months gross increased \$506,300, and net decreased \$663,500. All the lines west of Pittsburgh and Erie report for July gross decreased \$368,300; net decreased \$237,400, and for the seven months gross increased \$358,300, and net increased \$63,100.

Cleveland, Cincinnati, Chicago & St. Louis.—The earnings for July for three years were:

	1896.	1895.	1894.
Gross earn	\$1,068,154	\$1,162,133	\$921,563
Oper. expen.	820,341	921,925	816,844
Net earn	\$247,813	\$240,208	\$104,719
P. c. exp. to earn	76 3/4	79 3/4	88 3/4
Charges	251,500	235,077	232,468
Surplus	\$16,253	\$5,131	Def. \$127,749

The net earnings in July, 1893, were \$236,577 and in 1892, \$234,837.

Crystal River.—This road will be sold at sheriff's sale, at Aspen, Col., on Sept. 8, to satisfy a mechanic's lien in favor of Orman & Crook, the contractors, for a little over \$35,000. The road extends from Carbondale, Col. (a station on the Denver & Rio Grande), up the Crystal River to the mouth of Coal Creek, thence up Coal Creek to its head, a total distance of 29 miles. The line was built to reach the mines of the Colorado Fuel & Iron Co., on Coal Creek.

Delaware River & Lancaster.—A plan to equip and operate this road, in Northern Chester County, Pa., as an electric road is likely to be carried out. The road has lain idle for a year or so. It is about 13 miles long, beginning at the Pickering Valley, three miles west of Phoenixville, and ending at French Creek Falls, on the Wilmington & Northern road. The road will probably be extended westward to connect with the New Holland and Lancaster trolley road and eastward along the Schuylkill River to Philadelphia, making a continuous trolley line from Philadelphia to Lancaster.

Georgia & Alabama.—A summary of earnings to July 31 has been published as follows: For 10 months the earnings of 288 miles, the average operated, have been \$544,305, and the net \$161,602. The August gross will approximate \$80,000 and the net \$25,000. A new issue of first mortgage preference bonds is offered for subscription and a statement of the bankers, J. L. Williams & Sons, of Richmond, says: These bonds represent an underlying indebtedness of about \$5,000 per mile on the road, the net earnings of which amount to four times the interest charges on the bonds. This company took possession of the old Savannah, Americus & Montgomery road in August, 1895, and has since acquired control of various branches and made a perpetual lease which gives the company entrance into Savannah, establishing a trunk line from Montgomery, Ala., 340 miles. Interest on the preference bonds outstanding is only \$6,000 a month.

The statement continues further: The line is exceedingly direct, is laid with steel rails, has iron and steel bridges, and with the completion of improvements under way the maximum grade will be about 1½ per cent. Large sums of money were provided in the reorganization for improving the property. The line from Montgomery to Lyons, 265 miles, is laid with 60-lb. rails; from Lyons to Savannah, 75 miles, with 63-lb. rails and heavier. The Fitzgerald Branch, 22 miles, is laid with 56-lb. steel rails. The road occupies a strong strategic position. It not only forms a part of the shortest line to Savannah from Atlanta, Columbus, Macon and Albany, Ga., Birmingham and Mobile, Ala., and New Orleans, but as these places are recognized as "gate cities" of the South, and all traffic going from Savannah to the West and Northwest must necessarily pass through one of these points, it follows that this route is not only the shortest by from 70 to 80 miles between Montgomery and Savannah, but is, moreover, part of the shortest line from the entire West and Northwest to the ocean at Savannah. In connection with the Southern Railway, with which it connects at Helena, 114 miles from Savannah, the road forms a line 14 miles shorter than the main stem of the Central of Georgia between Atlanta and Savannah. If the net earnings of the company, the shortest line, should only amount to 40 per cent. of what the net earnings of the Central of Georgia between Atlanta and Savannah, have averaged for some years past, it would be able to pay six per cent. dividends on its preferred stock, after providing for all of its interest charges.

The Georgia & Alabama passes through a region of unusual productiveness and fertility. On its eastern division the lumber and naval stores interests are extensive and profitable. Its local business is remunerative and increasing, and the road is developing important through business via the several steamship lines which run to Savannah from Northern points.

Memphis & Charleston.—Adrian Iselin & Co., of New York, state that more than 98 per cent. of the seven-per-cent. bonds has been deposited with their committee under the reorganization plan, and as the assets of the 6s, which are junior to these 7s, is not an essential part of the Iselin plan, they say that their plan is practically certain of success.

Meriden, Waterbury & Connecticut.—The newspapers in Connecticut report that since the purchase of this road by Judge Robinson, of Hartford, Vice-President of the New York, New Haven & Hartford, several months ago, no trains have run, and the line is falling into a bad condition. "The buildings in Waterbury, never well built, are falling to pieces for lack of repairs, and platforms have rotted away. Many of the bridges on the line are said to be unsafe for trains, and rails on the main line and sidings have spread so that trains could not be run now if it was desired to have them. Freight is delivered to Waterbury concerns having spur tracks on the line of the road by the New England company, but the Meriden line is used in no other way and the property is depreciating in value hundreds of dollars a day."

Ulster & Delaware.—The earnings for the year to June 30, for three years were:

	1896.	1895.	1894.
Gross earn.....	\$419,354	\$405,227	\$428,053
Oper. exp.....	314,913	315,079	289,150
Net earn.....	\$104,441	\$90,148	\$138,903
Other income.....	16,707	34,128	913
Total income.....	\$121,348	\$124,276	\$139,816
Fixed charges.....	112,370	115,128	112,993
Surplus.....	\$8,978	\$11,148	\$26,823
Total surplus.....	425,770	418,147	415,432
Cash on hand.....	11,558		

Net earnings in July, 1893, were \$243,570, in 1892, \$240,329, in 1891 \$340,851, in 1890, \$334,463.

Wabash.—The earnings for July were:

	1896.	1895.	Dec.
Gross earn.....	\$145,499	\$1,074,022	\$28,522
Oper. exp.....	730,185	756,908	26,023
Net earn.....	\$315,314	\$317,813	\$2,499

Chicago, Burlington & Quincy.—Earnings for July were:

	1896.	1895.	Inc. or dec.
Gross earn.....	\$2,753,350	\$2,651,765	I. \$101,584
Net earn.....	\$973,323	\$862,594	I. \$110,729
Surplus.....	\$93,331	D. \$10,360	I. \$103,693
Jan. 1 to July 31:			
Gross earn.....	\$18,315,468	\$17,320,650	I. \$1,024,818
Net earn.....	\$5,970,402	\$5,555,608	I. \$414,795
Charges.....	6,180,000	6,110,681	I. 49,318
Deficit.....	\$189,597	\$555,073	D. \$365,475

Net earnings in July, 1893, were \$928,398; in 1892 \$1,096,078, in 1891 \$1,130,467, in 1890 \$770,676.

Oregon Short Line & Utah Northern.—The reorganization plan has been declared operative by the reorganization committee. Nearly 90 per cent. of all the bonds and stock have been deposited.

Philadelphia & Reading.—The July earnings of the railroad company are given as follows for four years:

	1896.	1895.	1894.	1893.
Gross earn.....	\$1,720,603	\$1,814,150	\$1,779,014	\$1,867,378
Oper. exp.....	1,007,721	1,000,462	986,000	1,082,067
Net earn.....	\$712,881	\$813,688	\$793,013	\$785,311
Other income.....	91,559	84,721	69,179	90,395
Total net income.....	\$804,441	\$898,410	\$862,192	\$875,706
Fixed charges.....	794,927	810,236	873,049	397,298
Surplus.....	\$9,513	\$88,173 def.	\$19,856 def.	\$61,592

Eight months' deficit..... 1,151,586 554,133 1,167,411 1,083,643

The Coal & Iron Co. reports the following results:

	1896.	1895.	1894.	1893.
Gross earn.....	\$2,028,205	\$1,905,605	\$1,639,874	\$1,640,401
Oper. exp.....	1,961,429	1,957,283	1,489,578	1,548,376
Net earn.....	\$66,776 def.	\$51,677	\$150,293	\$92,025
Fixed charges.....	95,000	95,000	122,209	108,320
Deficit.....	\$28,223	\$146,677 sur.	\$28,086	\$16,295
Eight months' deficit.....	1,198,287	1,205,897	\$ 4,256	721,485

Electric Railroad News.

Beaver Falls, Pa.—The principal stockholders of the Beaver Valley Traction Co.—John M. Buchanan, Robert S. Kennedy, John P. Sherwood and Dr. H. S. McConnell—have bought from J. C. Whitla, A. R. Leyda, George E. Smith and C. P. Wallace the controlling stock of the Grandview electric road. John M. Buchanan was elected President of the Grandview Company, to succeed C. P. Wallace, whose stock he purchased.

Chattanooga, Tenn.—On August 31 Mr. J. P. Ragon was appointed Temporary Receiver of the Chattanooga Electric Railway Co. in the suit of the Union Trust Co., of Philadelphia, against the road. Among other allegations is the bad condition of the system, the deterioration of the property in its present hands and a default in the interest of first mortgage bonds amounting to \$550,000. The case was set for hearing on Sept. 5. The property was sold in April last as an outcome of proceedings in the United States Circuit Court, but to which the present plaintiffs, the first bondholders, were not parties, and was bought in by a syndicate controlling the second bonds, amounting to \$650,000. The property in question embraces the consolidated street-railway lines of Chattanooga, comprising over 50 miles of track.

Montclair, N. J.—The Verona & Caldwell electric road was formally opened on Aug. 31. Three cars from the North Jersey Street Railway Co. carried a number of invited guests over the line. The new road is three miles long, and connects Caldwell with Montclair.

Pittsburgh, Pa.—The capital stock of the Brownsville Avenue Street Railway has been increased from \$200,000 to \$300,000 to complete the building and equipment of the line.

Sioux City, Ia.—Reports say that within a month the Sioux City Traction Co.'s lines, and also the property of the South Sioux City Traction Co., will be sold to an Eastern syndicate, and that the Philadelphia stockholders who now control the road will dispose of their entire interests. This means there will be a change in the management and J. C. French, the present General Manager, states that it is not unlikely that he will sever his connection with the company.

Webb City, Mo.—On Aug. 21 the Southwest Missouri Electric Railway Co. closed a deal whereby it obtained control of property formerly belonging to the Jasper Electric Railway Co. and the Joplin and Galena Electric Railway Co., thus giving a line from Carthage, Mo., to Galena, Kan., 32 miles of road, and connecting Carthage, Cartersville, Webb City, Johnstown, Prosperity and Galena. The main offices will be in Webb City.

Worcester, Mass.—Negotiations are in progress between the new Worcester & Marlboro and the Marlboro & Hudson street railways, by which the former will acquire by lease or purchase the plant of the latter, now in operation. It is understood that a satisfactory price has been reached, and there is little doubt that Worcester will be thus connected with Shrewsbury, Northboro and Marlboro, and also with Hudson, six miles beyond.

TRAFFIC.

Traffic Notes.

The Pennsylvania has taken off some suburban trains at Baltimore and Washington, in consequence, it is said, of the competition of electric car lines in the streets.

The principal railroads of Texas, through their Car Service Association, have voted to establish a cotton-weighing bureau, on the plan, employed two years ago. The manager of the Car Service Association will appoint a weigher at each compress.

The St. Louis Republic reports that during the month of July the average time of fast freight received in that city, over the Wabash road from New York, was 60 hours 22 minutes, and that 97½ per cent. of the through fast freight was delivered on time.

The Houston Direct Navigation Company, carrying freight from Houston, Tex., to Galveston, by water, has raised the rate on cotton from six cents per 100 lb. to eight cents, making the rate uniform whether cotton goes to the wharf at Galveston or is transferred to ocean vessels in the stream.

The arrangements for through billing of freight over the Colorado Midland and the Midland Terminal, which have been suspended for the last six months, have been resumed, by order of Judge Caldwell, the basis of division of revenue being the same as that in effect before the roads began their war.

The Erie Railroad has issued a new form of mileage ticket, conforming to the New York state law. The tickets are good for the buyer's family, but coupons have to be exchanged for card tickets before entering the cars. The regular form of mileage ticket is retained for interstate business. It is reported that the Erie will enter suit in the courts to test the Ohio law requiring bicycles to be carried free.

The receipts of grain from the West at Buffalo for the month of August were the largest on record, being 20,286,278 bu., or, including flour, 26,241,778 bu. The receipts since the opening of navigation aggregated 107,550,853

bu. The shipments by canal for August were 5,288,173 bu., and from the opening of navigation 21,664,263, as against shipments of about one-half this quantity last year. The shipments by rail were 64,000,000 bu.

The receipts of grain and flour by railroad at New York, in July, aggregated 7,146,000 bu. (flour reduced to wheat). The receipts by the principal roads were (thousands of bushels):

	1896.	1895.
N. Y. C. & H. R.....	1,809	1,928
Erie.....	1,568	1,989
Penn.....	372	515
West Shore.....	1,376	444
Lehigh Valley.....	1,353	319

Interstate Commerce Commission.

The Commission, in an opinion by Commissioner Clements, has announced its decision of the case of the Omaha Commercial Club against the Chicago, Rock Island & Pacific, and other carriers between Texas points and Omaha, Kansas City, St. Louis and other Mississippi River points and Chicago. The commission holds that the maximum rates between Omaha and Texas points should not be as high as those between Chicago and Texas points, and should not exceed those between Davenport, Rock Island and Moline and Texas points, and the rate on syrup from Omaha should not be in excess of that from Davenport.

"Carriers have no right to disregard distance and natural advantages for the purpose of bringing about commercial equality.

"The practice, if lawful, of giving to Kansas City, on shipments from the West through Pueblo, Colorado Springs, Denver and Cheyenne, and from the Northwest through Cheyenne, rates not higher than on such shipments to Omaha furnishes no warrant for giving Omaha rates from Texas points not higher than those to Kansas City, the circumstances and conditions in the two cases being substantially dissimilar.

"Through rates are matters of contract between carriers composing through lines and the Commission has no power to compel connecting carriers to contract with each other.

"If, in cases of shipments under a through bill of lading and a through rate the privilege of 'stoppage in transit' at an intermediate point and trying the market there, and, if it be found unsatisfactory, of re-shipping on to the point of original destination at the balance of the through rate be lawful, the granting of it to one locality and denying of it to another under substantially similar circumstances would be an unjust discrimination against the latter."

Chicago Traffic Matters.

CHICAGO, Sept. 2, 1896.

The all-rail lines have dropped out of the fight with the lake lines in Chicago-St. Paul traffic, leaving the field to the Lake Michigan & Lake Superior Co. and the Car Ferry line. The former has reduced its first-class rate to 15 cents, and the lower classes to six cents Chicago to St. Paul, and the Ferry has made a five-cent rate on all classes below fourth. The all-rail lines have agreed that in no event will they go below a 10-cent carload rate. The rail lines have now restored rates on all perishable commodities. It is reported that the all-rail lines are backing the Lake Michigan & Lake Superior Company against the "Ferry."

The reports current in the East that the Pullman Company is preparing to make a general reduction in all its rates cannot be confirmed at the general offices of the corporation in this city. President Pullman refuses to discuss the matter. Local railroad officers are inclined to place credence in the report.

The Interstate Commerce Commission will resume its investigation of Missouri River grain rates, and the alleged Western pool in Chicago, Sept. 21. In addition to the original lines, officers of the following roads have been summoned before the commission: Minneapolis & St. Louis; Kansas City, St. Joseph & Council Bluffs; St. Louis, Keokuk & Northwestern; Chicago, Burlington & Kansas City; Burlington, Cedar Rapids & Northern; Union Pacific; Burlington & Missouri River; Fremont, Elkhorn & Missouri Valley; Kansas City, Fort Scott & Memphis, and St. Joseph & Grand Island.

The running time between Cincinnati and Chicago has now been reduced to eight hours by both the Big Four and the Pennsylvania. The Cincinnati, Hamilton & Dayton and the Louisville, New Albany & Chicago joint line will probably make a similar reduction.

The Western roads refused to allow a \$7.50 rate between Chicago and St. Paul, for the G. A. R., going all-rail and returning rail and lake. The business to the G. A. R. encampment from this city has been very fairly divided and the agreed rates have been well maintained.

The Missouri Pacific has given notice that it will reduce grain rates from trans-Missouri territory generally to St. Louis 3 cents per 100 lbs. The Rock Island announces a rate of 37 cents per 100 lbs. on bullion, Denver to New York, and 43 cents to Philadelphia and Boston. The route is rail and water via Galveston. This is against a rail and lake rate of 41½ cents Denver to New York via Chicago.

In the two months to September 1 receipts of grain at Chicago have been about 70 per cent. larger than in 1895, the aggregate quantity being 45,610,000 bu., against 26,769,000 bu. last year.

The bulk of the eastbound traffic from Chicago is still going by lake. Total shipments by water last week amounted to 122,229 tons, of which 105,374 tons were grain. All-rail shipments last week footed up 63,179 tons, compared with 58,505 tons for the preceding week, an increase of 4,674 tons, and against 56,085 tons for the corresponding week of last year. Last week's traffic was carried by the roads in the following proportions:

Roads.	WEEK TO AUG. 29.		WEEK TO AUG. 22.	
	Tons.	p. c.	Tons.	p. c.
Michigan Central.....	7,373	11.7	6,138	10.5
Wabash.....	6,381	10.1	6,634	11.4
L. S. & M. S.....	7,226	11.4	5,921	10.1
Pitts., Ft. Wayne & Chicago	6,341	10.0	7,160	12.2
Baltimore & Ohio.....	6,375	10.1	7,219	12.3
Pete. Cn. Chl. & St. Louis	6,855	10.8	5,521	9.4
Grand Trunk.....	5,733	9.1	5,356	9.2
N. Y. C. & St. L.....	6,017	9.5	6,245	10.7
Erie.....	7,382	11.7	4,854	8.3
C. C. C. & St. Louis.....	3,516	5.6	3,459	5.9
Totals.....	63,179	100.0	58,505	100.0

Of the above shipments 2,948 tons were flour, 24,975 tons grain and millstuffs, 13,917 tons provisions and lard, 11,318 tons dressed beef, 2,352 tons butter, 1,470 tons hides and 3,578 tons lumber.